RAILROAD GAZETTE

FRIDAY, JULY 8, 1898.

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Contributions.

The Air Brake and the Electric Brake.

New York, June 1.

To the Editor of the Railroad Gazette:

I observe that in printing Mr. Potter's discussion on "Motive Power" at the April meeting of the New York Railroad Club [Railroad Gazette, May 27, p. 374], you omit those of Mr. Potter's words inclosed in brackets below:

"Each of the 4 axles is equipped with a motor and the car also has [another feature which is peculiar to electric motors; that is] the electric brake, and I might say in that connection that it will be interesting to steam road men to know that at night, when running from 40 to 50 miles an hour, they stop for a passenger at the flare of a match scratched on the rail.

"[Measuring the force of retardation, compared with that ordinarily attained in stopping by air brakes, the L. & C. cars vary from 200 to 300 pounds per ton, while air braking is usually from 100 to 200 pounds. This means that the electric brake insures stopping within about two-thirds the distance that would otherwise be secured."]

I protest against depriving your readers of these wise and entertaining views; but there seems to be something remarkable either about the electric brake in question or about the views of Mr. Potter concerning it. Mr. Potter compares the efficiency of the retarding force of the electric brake with that "ordinarily attained in stopping by air brakes." This is somewhat vague and indefinite, as the electric brake appears to have been applied to a single vehicle of special construction, and the efficiency of the air brake "ordinarily attained" is with respect to trains hauled by locomotives, which latter are almost invariably braked with less efficiency than are the cars. A proper comparison of the relative efficiency of the electric and air brake should be made under the same conditions, and any other comparison would be of no practical importance.

More or less has been claimed for superior traction of electric cars, through the influence of the electric current which passes through the point or line of contact between the wheel and the rail. To whatever extent the adhesion may be increased in this manner, the efficiency of the electric brake might also be increased if the current is passing between the wheels and the rails during the time that the brake is in operation.

Beyond this, it is manifest that the retarding force, without sliding wheels, which is available for one style of brake, is equally available for the other. It cannot, for a moment, be supposed that the adhesion is increased 50 or 100 per cent. on account of the passage of an electric current through the point of contact between wheels and rails; and, if Mr. Potter's comparison has reference to electric and air brakes applied under the same conditions, it is clear, on the face of it, that the air brake must have been applied in a most inefficient manner. The air brake is capable, if properly applied, of developing any required retarding force whatsoever, and is therefore in all respects the equal of the electric brake, unless it is true that electric adhesion is greater than ordinary adhesion, and it is then only inferior to the extent of that difference.

AIR BRAKE.

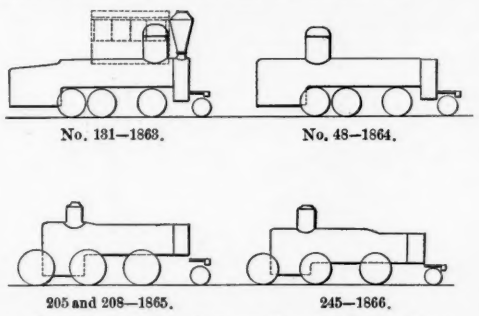
Mogul Locomotives in 1862.

Adamsford, Pa., May 16, 1898.

To the Editor of the Railroad Gazette:

Referring to the article in your issue of May 13, entitled "When Was a Locomotive Called a Mogul?" I would say that some time in the latter part of 1862 Mr. J. P. Laird, Master Mechanic at Altoona shops at that time, rebuilt Ross Winans' "camel" engine No. 131 (originally the Seneca), retaining Winans' type of boiler with dome on the forward ring and the original cab and cylinders, but with new frames; and in these frames were a pair of leading wheels in front of cylinders, arranged in a Bissell truck, and three pairs of drivers. The center of the first driving axle was 84 in. from center of leading wheel, the center of second pair 84 in. from center of first drivers and centers of third pair 52 in. from second pair; all three pairs being between cylinders and firebox. I have, still in fair condition, a water color picture I made when a boy of this engine so arranged, and it bears my date of painting it as July 10, 1865.

Later Laird rebuilt Winans' camels 48, 50, 51, 52, 83, 91, 119, 121, 124 and 130 with almost identically the same arrangement of wheels; and if this arrangement of the driving wheels forward of the firebox could not strictly entitle the engines to the name "Mogul" it can further be shown that he, in 1866, rebuilt engines 205, 208 and 169 for passenger service with one pair of 33-in. leading wheels in a Bissell truck forward of cylinders and three pairs of 60-in. driving wheels spaced as follows: First to second (centers) 83 in.; second to third (centers) 83 in. The first pair was close to cylinders and the third pair was behind the firebox. The distance from center of leading wheel to center of first driver was 90 in. He also rebuilt engines 347 and 261 for passenger service in similar style, except that he used 66-in. drivers; and a freight engine built as a 10-wheeler by Baldwin in 1861 (No. 245) he also rebuilt as a mogul with 54-in. drivers spaced as follows: Center of first pair 89 in. from center of leading wheel in Bissell truck; second drivers 95 in. from first (centers), and third drivers 87 in. from second pair (centers); first pair close to cylinders; third pair behind firebox.



No. 131—1863. No. 48—1864.

205 and 208—1865. 245—1866.

Early Pennsylvania Railroad Mogul Locomotives.

Photographs of these engines taken by the railroad company previous to May, 1868, and mounted in a book for use of their Master Mechanics and others at that date, distinctly show plates on side of steam-chests, reading "Rebuilt at Altoona Shops, 1866," on the engines 205, 169, 261 and 245, all which are unquestionably mogul type. And as to the others having the wheels arranged mogul fashion, but forward of the firebox, the date of rebuilding No. 131 is 1863 beyond question, and I, myself, saw this engine in this shape in Altoona yard in April, 1864, and near it was No. 48, just out of shop in similar shape.

If the fact of the firebox being back of rear drivers is urged as an obstacle to these rebuilt engines being classed among moguls I wish to say that through the courtesy of the Baldwin Locomotive Works I recently took dimensions of the drawings of an engine which they call a mogul, built in 1868 for the Morris & Essex, and it shows a firebox 108 in. long over all outside; having rear driving axle under it 78¼ in. from the front end and 29¾ in. from the back end.

Photographs in the book I have referred to show P. R. R. engines 91 and 210, both rebuilt in the style of 131, and bearing plates showing date of such rebuilding as 1867 and 1866 respectively.

Two of these books, at least, are still in existence and in almost perfect order.

The dimensions of the P. R. R. engines as given were scaled from photographs and while perhaps not perfectly accurate, vary so little from the actual measurements as to fully meet the requirements of this letter.

C. H. CARUTHERS.

Train Service in England.

London, June, 1898.

To the Editor of the Railroad Gazette:

Every country has its own railroad problem. In most countries the important questions fall under two heads, the relation between the railroads and the State, and the question of tariffs. Germany has practically finished the nationalization of its railroads; the Belgian State will soon have absorbed all the private lines; the Switzerland nationalization is just beginning. In France and in America the relation between the State and the private companies is a subject of perennial interest. So with tariffs. Prussia, from a time almost beyond the memory of the present generation of railroad men, has been going to re-arrange its passenger fares; the establishment and maintenance of stable and equitable rates charged to all customers alike is in America a question whose importance can hardly be overestimated.

England, in this as in other matters, asserts its insularity. The question of State control is in abeyance, and no voice is heard to suggest any modification in our haphazard system of regulation, partly legislative, partly judicial, and partly administrative. Of rates also little is said. Thanks to prosperous trade and high prices for agricultural produce, traders and farmers alike have almost ceased to complain of the goods rates as they have finally settled down after the general revision in the years 1893-4. Passenger fares have been generally rearranged and now are fairly uniform over the country at standard rates of 2d. per mile first class (1½d. in districts served by the Midland Railway Company), 1¼d. per mile second-class, where second-class exists at all, and 1d. per mile third class.

Our English problem is now and seems likely to be in the immediate future that of train service. Not so many years ago we flattered ourselves that Englishmen were the only people who knew how to work a railroad properly. But more recently our complacency has been somewhat rudely disturbed. When tales came from America of phenomenal speeds, such as that of the "Atlantic City flyer," they were at first simply put aside as romance. Then came an effort to discredit them. The records were, it was said, carelessly kept; times were taken not to a stop at the station, but to a signal box outside; it was even stated that the American mile was, like the American ton, less than the English. Finally, the reluctant admission has had to be made that our trains are slower, though lighter, than the best trains in America; and oddly enough, there are those who have made the contemporaneous discovery that English people prefer second class speed. But unfortunately, it is coming to be a question not of second, but of third class. For within the last few weeks Mr. Rous-Marten, an observer whose accuracy is above question, has pointed out that the Northern of France is running from Paris to Amiens, 81¾ miles, in 85 minutes, a performance which we cannot profess to match in this country.

And it is further becoming notorious that in the tourist season our expresses fail to accomplish in practice what they are set down as doing on paper. Last summer, especially, punctuality went to the winds, and according to all accounts, for a long distance express even on our best lines to reach its destination on time was a very exceptional event. Unfortunately, it is easier to chronicle the fact than to suggest a remedy. Luggage is one of the great difficulties, and though the companies are doing their best to encourage passengers to send their luggage in advance by slow train, the British public refuses to take kindly to the innovation.

Lines are being widened in various directions. The Midland Company, for instance, has just obtained Parliamentary power to spend over three and a half milions sterling in quadrupling long stretches of its main line. But this course, though doubtless necessary, fails to relieve the block at great junctions like Crewe and Derby and Bristol, where trains converge from all parts of the compass. One company, the Great Western, in many respects the most progressive in the country, seems to have come to the conclusion that punctuality under existing conditions is impossible. For in its time-table for May it has "decelerated" (the word has been recently introduced; in our earlier railroad experience we had no need for it) quite a number of its best expresses by five and six, and in one case even by 15 minutes. A neighboring company has quickened somewhat the running of one of its trains, and added the time so gained to the time allowed at an important junction. But growth of traffic and the constant increase of heavy corridor-carriages and dining cars is adding so greatly to the weight of trains that it is all our ordinary engines can do to keep time, even at existing speeds. Every railroad man acknowledges that in principle piloting, or, as it is called in the States "double-heading," is objectionable, yet year by year piloting increases. It is out of the question to build engines here of the size usual in America. Every tunnel and over-bridge and every platform in the country would have to be rebuilt to let them pass. But our locomotive engineers seem to have set themselves to turn out engines which, at least, are bigger and more powerful than any we have known hitherto. At this moment the North Western is experimenting with a 4-cylinder compound, the London & South Western and the Glasgow & South Western have each built a 4-cylinder simple engine, the North Eastern, which was thought to have tested compounds and abandoned their use, has a new 3-cylinder compound, while the Great Northern is bringing out the first locomotive of your "Atlantic" type ever built for passenger service in this country, with 4-coupled driving wheels in front of the fire-box and a small pair of wheels beneath it.

At the same time questions of organization are not being neglected. The abolition of premiums for coal saving and their replacement by premiums for general efficiency of work are being strongly urged.

Closer control of locomotive working by the traffic (operating) officials is being considered. More than one company has apparently come to the conclusion that it would do well to recruit its traffic staff from practically no precedent. We are even coming to recognize that something is to be learnt from extra-English experience. One company has already sent an official over to America to study electrical development that he hopes to make arrangements during the coming Autumn for a special investigation of the question of automatic couplings "and one or two others connected with railroad administration in the United States."

W. M. ACWORTH.

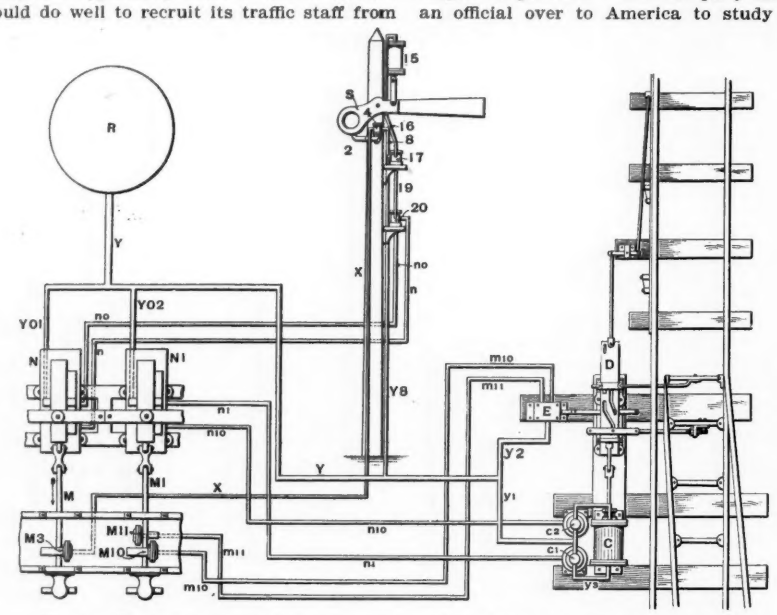


Fig. 1.—Pneumatic Interlocking—Connections from Cabin to a Switch and a Signal.

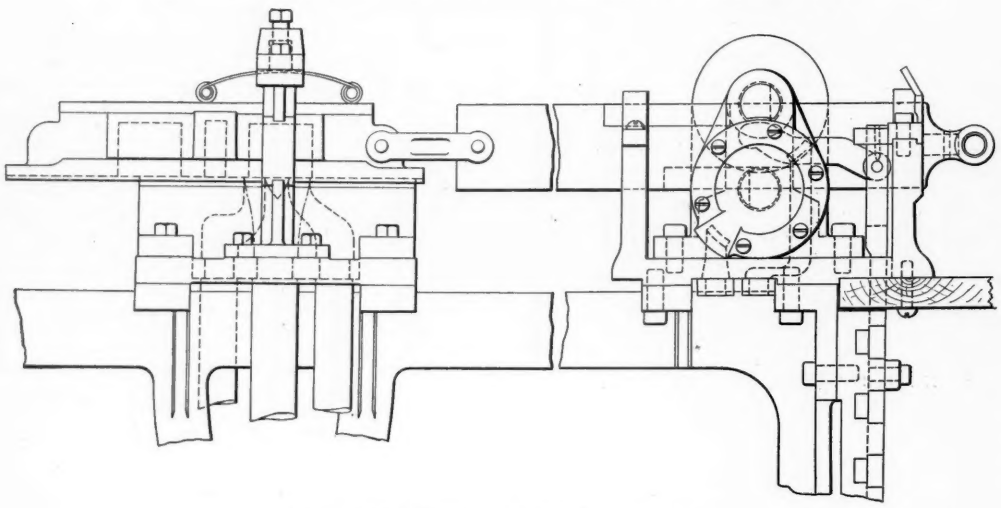


Fig. 2.—End Elevation of Interlocking Machine.

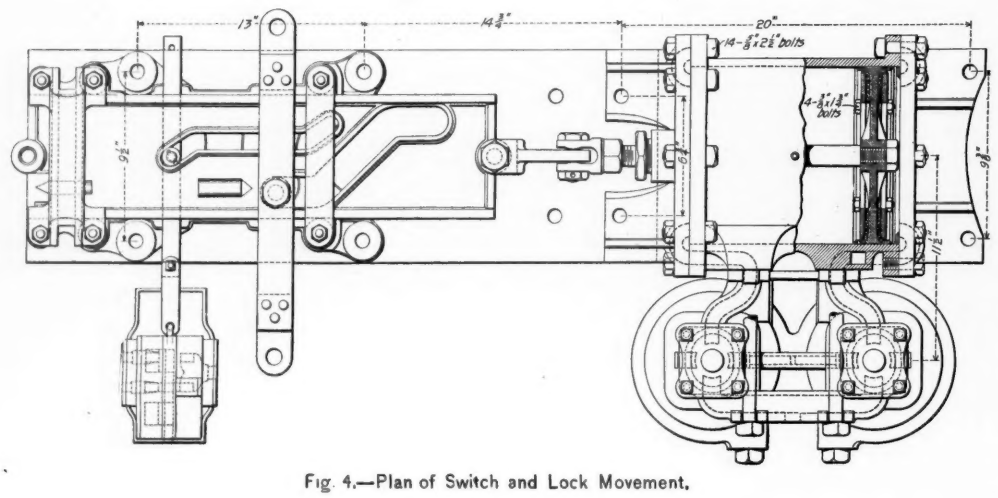


Fig. 4.—Plan of Switch and Lock Movement.

Pneumatic Interlocking at Exchange Street, Buffalo.

The Pneumatic Railway Signal Company of Rochester has lately put in for the New York Central & Hudson River road at the northern end of the

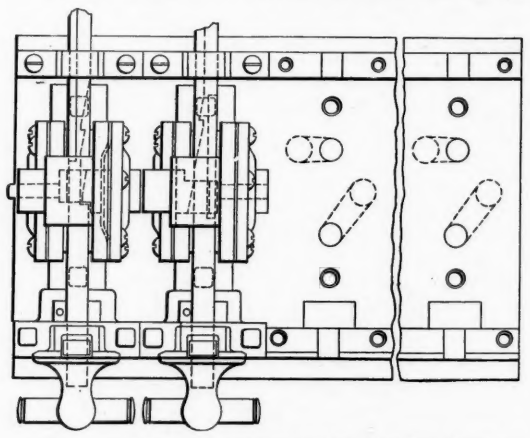


Fig. 3.—Partial Plan of Interlocking Machine, Showing Indicator Diaphragms.

Union passenger station at Exchange street, Buffalo, an interlocking plant, containing 25 switches and 33 signals, in which all the functions, including the return impulse from a switch to unlock a signal, are performed by compressed air. The air is used at low pressure, as in the crossing signals and derailing switches built by the same company, described in the Railroad Gazette of Dec. 22, 1893. In the plant now described the interlocking, unlike that in the machine of 1893, is effected by tappets actuating bars sliding in a frame, like the common Saxby & Farmer locking, though the frame is fixed beneath the front of the machine, vertically, as in the National Company's machine. The parts are, however, only about half as large as in an ordinary mechanical machine, and the Buffalo machine is all above the floor.

The apparatus consists principally of: (1) A pair of Duplex air compressors. (2) A reservoir to which the air is conveyed through a sufficient length of cooling pipes to precipitate the moisture, though there is seldom enough of this to be noticeable. (3) Supply pipes running to each switch and signal to be operated. (4) Ten-inch cylinders for moving switches and 5-inch cylinders for semaphore signals. (5) Half-inch galvanized iron pipe, laid under ground, and (6) the interlocking machine. Valves admitting air to and exhausting it from the cylinders are actuated by rubber diaphragms about 8 in. in diameter and having a movement of ¼ in.

From the machine in the cabin to each switch there are four pipes; one for each end of the cylinder and two for returning the indication of the movement of the switch. To each signal there are two pipes, one for clearing the signal and one for returning it to danger, although where the signal is very near the tower this latter pipe can be dispensed with, as it is only used to insure quick action. In all the supply pipes outside the tower the pressure is 15 lbs. per sq. in., and this is the pressure used in all cylinders. The pressure carried behind the operating valves, and in the pipes n, no and n10 (See Fig. 1), is 7 lbs. This is done solely for the purpose of saving air.

In the machine, horizontal slide valves take the place of the levers of a mechanical machine, and pulling or pushing these levers through a stroke of 3 in. constitutes the manual work of the signalman. As before explained, the locking tappets extend downward from the valve rods or handles, and are con-

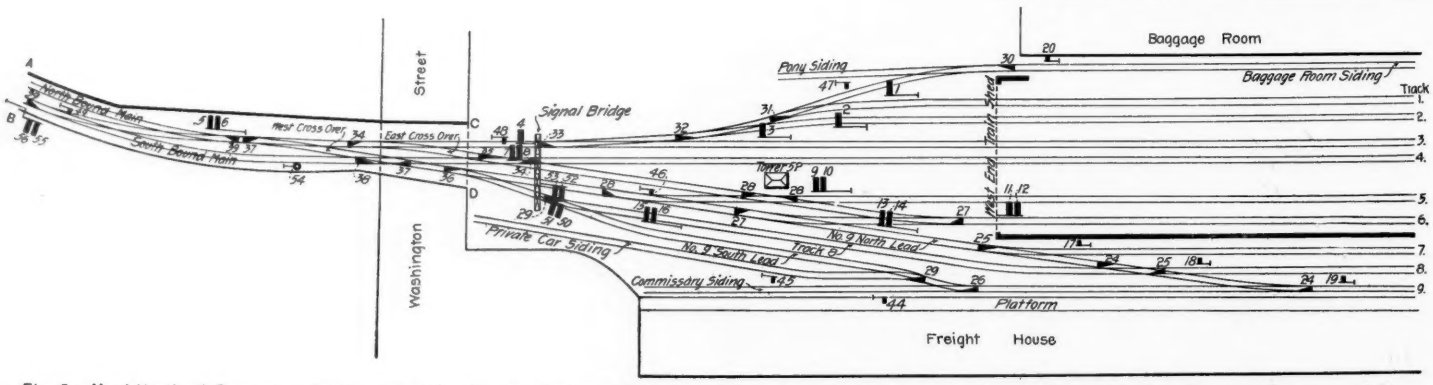


Fig. 5.—Yard North of Passenger Station at Buffalo—New York Central & Hudson River Railroad. Switches and Signals Wo ked by Low-Pressure Compressed Air.

PNEUMATIC APPARATUS FOR SWITCHES AND SIGNALS AT BUFFALO; NEW YORK CENTRAL & HUDSON RIVER RAILROAD.

classes possessing a more thorough general education, and one railroad to my knowledge has recently found places for no less than four men with high University degrees, a thing which has hitherto had

nected thereto by a slotted movement in such a way as to provide for preliminary locking.

Each switch piston moves a detector-bar and a switch and lock movement, as well as the switch;

but with a 10-in. cylinder and 15 lbs. pressure, a switch 500 ft. from the cabin is moved and the valve rod in the machine is released (for the completion of its stroke), by the return impulse, in less than three seconds. Signals within 500 ft. of the tower move practically with the lever. No auxiliary reservoirs are used either at switches or signals, and the signal post presents a very neat appearance, being unincumbered by anything but a plain cylinder. The diaphragm valves are placed at the base of the post, (though in Fig. 1 they are shown near the top).

In Fig. 1 are shown the connections for one switch and one signal. Compressed air flows from the receiver R to the machine through pipes Y. YO1 and YO2. The valves N and N1 control the admission of air to the cylinders at the switch and at the signal. The air which actually moves the switches and signals flows through Y, Y8 and y1. y2 supplies the indicating valve at the switch.

Admission of air to the semaphore cylinder 15 is controlled by valve 17. From the valve N in the cabin, pipes no and n, the latter passing through valve 20, control valve 17. Valve 20 is controlled by increase or reduction of pressure in pipe n o.

Pulling signal bar M to the limit of its forward stroke makes connection through valve N from the reservoir through YO1 to n. The air passes freely through valve 20, pipe 19, to valve 17, and by the movement of this valve admits air from Y8 to cylinder 15. This pushes down the semaphore to safety

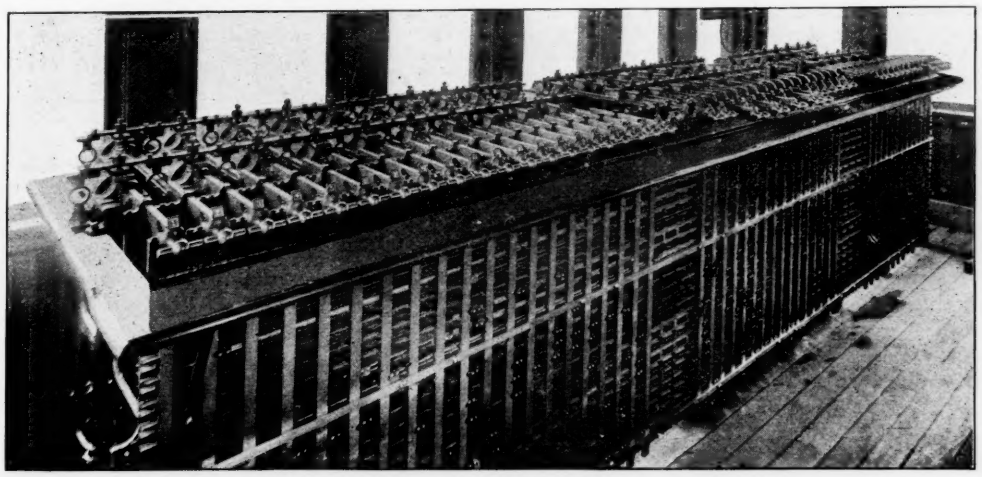


Fig. 6.—Interlocking Machine for Pneumatic Switch and Signal Movements at Buffalo.

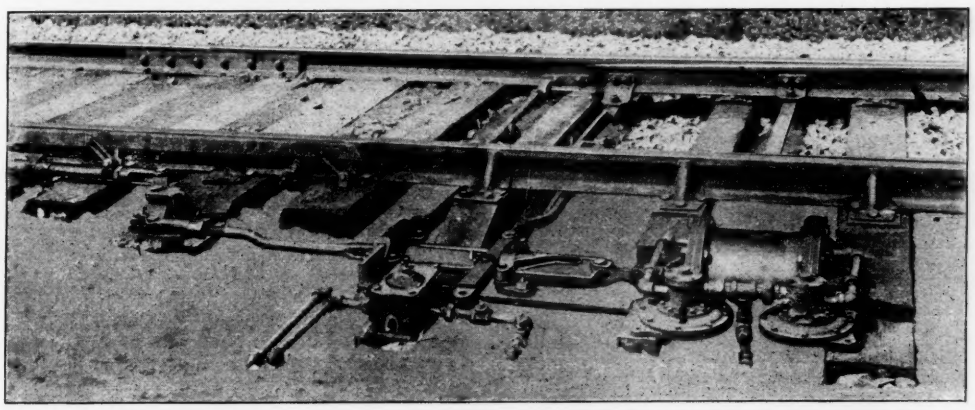


Fig. 7.—Switch and Lock Movement.

its related devices are in position for a new operation.

The switch valve N1 in the cabin has an inlet pipe YO2 and outlet pipes n1 and n10 leading to valves c2 and c1, controlling switch cylinder C. Switch operating bar M1 is controlled by M10 and M11; from these the pipes m10 and m11 run to the indicating valve at the switch.

The operation of the apparatus is as follows: When M1 is pulled it is stopped, before the stroke is finished, by M11, in such a position that valve N1 connectsYO2 with pipe n10. This operates valve c2, which connects y1 with one end of the cylinder, thus throwing the switch.

Switch indicating valve E, normal, allows a constant pressure through Y2 and pipe m10 to M10; but m11 running from M11 is normally not under pressure, being open at E. M10 and M11 can latch the bar only when there is no air pressure upon them. Consequently, M11 is in a latching position, and as stated, M1 is latched by M11 as soon as it has made a partial stroke sufficient to connect YO2 with n10.

When air through c2 has thrown the switch piston its full stroke, pipe m10 is connected to the exhaust through valve E and m11 is connected with y2.

In this position pressure is put upon the lock M11 and is taken from the lock M10, whereupon the bar M1 may be pulled to its extreme position. As above described, this extreme position connects the pipes n1 and n10 with the exhaust, thus cutting off the air

and, through lever 2, closes valve 4. As the air in pipe X has been under pressure it has held the indicator and latch M3 so as not to lock bar M; now the valve 4 closes the inlet to pipe 8 and opens X to the atmosphere. This brings the indicator and latch M3 into latching position. The signal bar cannot be moved all the way back to its initial position until this latch is relieved.

If, now, the signal bar is moved back to the latching point the first operation connects the inlet YO1 with the pipe n o, which admits air pressure into n o and operates the valve 20, shutting off the inlet N to said valve and connecting the pipe 19 to the exhaust. This permits the valve 17 to move back to its initial position and connects the pipe 16 to the exhaust, which at the same time cuts off the air pressure from the supply pipe Y8, whereupon the semaphore may return to its initial position; and upon such return the semaphore strikes a lever operating valve 4, connecting it again with the inlet Y8 through pipe 8 and re-establishing pressure in the pipe X, which operates the indicator and latch M3 and releases the operating bar M. As soon as this unlocking operation has occurred the valve N may be pushed back to its initial position, which cuts off the inlet YO1, and opens both pipes n o and n to the exhaust, relieving the pressure upon the valve 20 and allowing it to return to its initial position. Thereupon the semaphore and pressure through the pipe n10 upon the valve c2. This operation produces no effect upon the cylinder C and switch remains in its set position.

If now it is desired to return the switch to its original position, the switch operating bar M1 is pushed inward, but it is stopped midway by the lock M10. In this position the valve N1 connects the inlet YO2 with the pipe n1, which conveys air pressure to the valve c1 and opens it, thus connecting the switch cylinder with y1, whereby the cylinder is moved and the switch is reset to its former position. This motion of the switch moves E back to its original position, opening m11 to the atmosphere, introducing pressure in the pipe m10 and releasing the lock M11 from the operating bar M1; this bar may now be returned to its initial position, cutting off the air supply from n1 and opening n1 and n10 to the atmosphere, thus relieving the valves c1 and c2 from pressure and closing the air supply to both ends of the cylinder. After these operations all the parts are in their original positions and ready for a new operation.

The pneumatic apparatus for indicating in the tower the position of signals, which is shown in Fig. 1, is not used at Buffalo, and it is doubtful whether in practice indicators are needed. It has been decided, however, to put on some electric indicators. These and the pneumatic indicating devices are substantially the same in principle. Inside the signal cylinder on the post is a contact device, which by means of a single wire to the cabin actuates an electro-magnetic lock on the machine. The armature of this lock drops into notches in the lever bar, effecting the necessary locking. There are two of these locks on the machine shown in Fig. 6 (levers 34 and 38). These levers are for switches located in the "tunnel" out of sight of the operator, and they indicate not only the position of the switches, but also, by means of a short track circuit, whether or not the track is occupied. The armature of the lock not only locks the lever, but is so formed as to act as a visual indicator for the signalman.

The tunnel, before mentioned, is such a short dis-

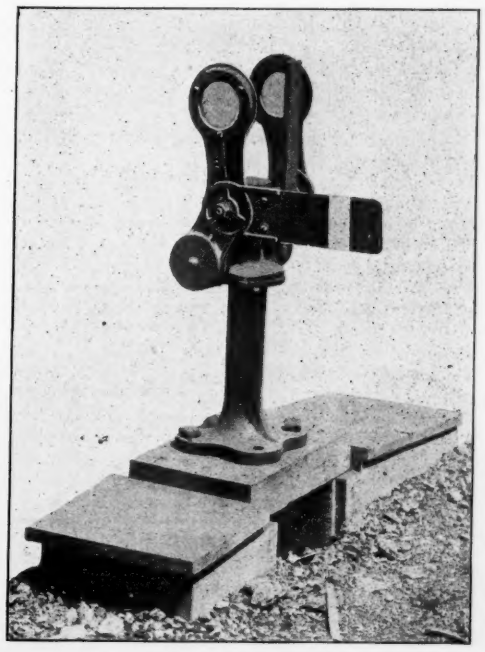


Fig. 8.—Dwarf Signal.

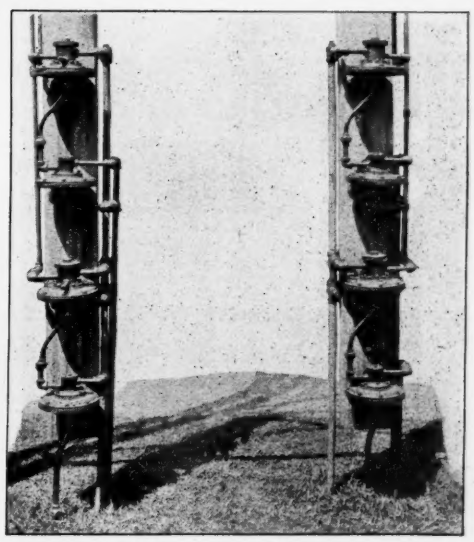


Fig. 9.—Valves for Signals on Bridge.

(The valves are fixed to wooden supports placed near the ground.)

PNEUMATIC APPARATUS FOR SWITCHES AND SIGNALS AT BUFFALO; NEW YORK CENTRAL & HUDSON RIVER RAILROAD

tance from the station that it is necessary to do a good deal of switching in it, and to facilitate switching movements signal 49 has an audible signal, consisting of a small air whistle, which sounds continuously while the signal is in the clear position. As this is a "back-up" signal, the noise of the whistle never disturbs passengers. The reverse movements over the switch are mostly of empty cars or baggage cars.

Signal 54 also has an audible signal, consisting of a 10 in. gong, which is rung by a small pneumatic device whenever the signal is clear. Signal 55 has an electro-pneumatic slot, controlled by a track circuit between this signal and signal 54, so that whenever there is a train on the track between these two signals No. 55 must go to danger.

About 912 trains are worked through this plant every 24 hours, and the number of switch movements is about 3,000.

The Nationalization of Swiss Railroads.*

On the 20th of February last the Swiss people, by more than two votes to one, definitely ranged themselves on the side of the majority of Continental nations, and decided that the ownership and working

*Extracts from a paper written for the "Economic Journal."

of railroads is a function properly belonging to and likely to be best discharged by the state. The emphasis of the popular determination is made all the more striking by the fact that a law authorizing the state purchase of the Central Swiss Railway was rejected by the people with 289,000 votes to 130,000 as recently as 1891.

To the well-worn platitudes [arguing for state purchase], there is added a new argument. Swiss railroad shares have, it is stated, of late years ceased to be held as permanent investments, they have passed in large measure into the hands of speculators, and they not Swiss citizens, but foreigners; and it is not only dangerous but undignified that this state of affairs should be allowed to continue. The argument sounds weighty, but M. Numa Droz points out that money necessary for the purchase of the railroads, officially estimated at about forty millions sterling, can never be raised by an internal loan and must be borrowed abroad, and that therefore the formula "les Chemin de fer suisses au peuple suisse" has a necessary complement, the further formula, "la dette suisse au peuple suisse."

In accordance with the terms of the various concessions, notice of the intentions of the state to purchase will be given to three of the five companies on April 30 of this year, to the Jura Simplon Company two years, and to the Gothard Company six years later. The date for completion of the purchase is five years after the notice, so that, unless by agreement—which at present looks very improbable—no actual transfer will take place till 1903.

The price to be paid is 25 years' purchase of the average net earnings of the 10 years preceding the notice, or, if this works out at less than 4 per cent. on the actual cost of the line, then the actual cost of the line is to be repaid to the company. Needless to say "actual cost" is an elastic phrase, and the Federal Supreme Court has yet to decide on its precise meaning. Further, the companies are required to hand over their lines "in thoroughly satisfactory condition," or, if not, the price is to be reduced accordingly. The companies claim that these words mean " in good working order," while the Executive Council aparently have understood them to mean not only that road and rolling stock must be as good as new, but even that a reduction may be made, where, for instance, a station is too cramped and old-fashioned to do its work perfectly, or a line needs doubling in order to avoid delays to traffic. M. Numa Droz seems to show good ground for thinking that at least six millions sterling must be added to the Council's estimated purchase price, while others put the figure very much higher again.

The Council's estimate would have left, after providing for interest on purchase capital at 3½ per cent., a surplus net revenue of £250,000 per annum to meet sinking fund, interest on capital spent in improvements and extensions, and reductions in rates and fares. According to M. Droz, the extra cost of purchase, even assuming the money to be borrowed at 3½ per cent., which he greatly doubts, will alone absorb almost the whole of the £250,000, leaving practically nothing for sinking fund, for the promised rate reductions, or for the necessary increase in the wages of the staff. Further, the estimate of new capital expenditure is grossly inadequate, far below the average expenditure of the companies in recent years, whereas, even during the passage of the bill through the Chambers, £4,000,000 has been added for two items alone, the Simplon Tunnel, and another tunnel under the Eastern Alps. On the whole, "at the end of 60 years, not only will the debt of £48,000,000 or more, incurred in 1903, remain unpaid, but it will have grown till it has reached £60,000,000, £72,000,000, or who knows what." . . .

Two points deserve special emphasis. Warned by the Prussian example, Section 8 of the Purchase Act provides that "the railroad accounts shall be kept separate from the other Federal accounts, so that the financial position of the railroads can at all times be clearly ascertained," and that, after payment of interest and sinking fund, 20 per cent. of the surplus shall be carried to a reserve fund, till this latter reaches £2,000,000, and 80 per cent. devoted to improvements, especially reduction of rates and fares and extension of lines, branch lines having the preference. Secondly, the discussions in the chambers displayed "a strong disinclination to give the central authorities more power than was absolutely necessary. The organization proposed by the Executive Council underwent many important modifications intended to secure not only the utmost possible decentralization, but also the participation of the cantons in the railroad management."

In outline the new organization will be as follows: The Swiss Parliament has reserved for itself the control of new capital issues, the approval of agreements for acquiring or working branch railroads, the sanctioning new lines, the general regulation of the tariffs, and the voting of the annual railroad budget. The Executive Council is empowered to issue orders for carrying into effect the Purchase Act, to appoint the principal railroad officers to nominate 25 members of the general railroad council, and to exercise a general power of inspection.

At the head of the railroad administration proper comes the general railroad council, consisting of 55 members, 25 of them, as already mentioned, appointed by the Executive Council, and required to be representative of trade, industry or agriculture, 25 nominated (one each) by the several cantons and half cantons, and five nominated (one each) by the several district councils to be presently mentioned.

The functions of the general council correspond roughly to those of an English board of directors. On the other hand, the general managership is, so to speak, put into commission, and the central executive authority is intrusted to a board of five to seven members appointed by the Federal Executive on the nomination of the general railroad council. So, too, the office of superintendent of each district is put into commission among three district managers. And just as the composite general manager has a general council to advise and control him, so, too, is the composite district superintendent advised and controlled by a district council. The act provides for five districts, with headquarters at Lausanne, Bale, Lucerne, Zürich and St. Gall, respectively, or in other words the headquarters of the five existing companies. The district councils will have from 15 to 20 members apiece, of whom only four are to be apointed by the Federal Executive, the remainder representing the cantons locally concerned. All this elaborate machinery, with its seven general managers, its 15 district superintendents and its 150 general and district councillors, is designed to work a railroad system which in capital, traffic and general importance may be roughly compared with a single English company of the second magnitude, such as the London & South Western or the Lancashire & Yorkshire, and which, according to the message of the Federal Executive, was to be managed by the State with an economy, uniformity and executive simplicity such as could not be hoped for under the companies.

A word in conclusion as to the prospects of the future. Swiss critics point to the dangers of local particularism. Already, as has been said, the Simplon Tunnel has had to be promised to western and central Switzerland, and then another tunnel for east Switzerland was required to redress the balance. Other less important lines have been promised also. But even so, voters who have to pay for the main lines, while for their own service they are wholly dependent on local branches which are left outside the State purchase scheme, are far from satisfied. And such voters are numerous; but the State cannot afford to become responsible for the purchase of the local lines also. Again, it is thought that the local councils are hardly likely to take wide views of the public interest or to work in harmony with the general council.

A broader and more generally interesting question may be propounded: "Can a democracy run a railroad?" The Swiss have avowedly copied the example of Prussia. But, in the words of Charles Francis Adams, "the executive may design, construct and operate a railroad; the legislative never can. A country therefore with a weak or unstable executive, or with a crude and imperfect civil service, should accept with caution results achieved under a government of bureaus." . . .

Professor Hadley writes of America as follows: "There is a strong popular feeling, to a large extent unsuspected by those in authority, in favor of Government ownership as a system. If it be true that Government railroad ownership would be a most serious political misfortune for the United States, we must be prepared to meet the danger with our eyes open." For my own part, I believe what Professor Hadley writes of America is equally true of England. I believe that State ownership would be a most serious misfortune for us. I believe also that a very large number, if not indeed a majority of the electorate, would be glad to vote in its favor. Therefore I submit that the experiment of railroad nationalization by the only democratic country in Europe besides our own is one to which we shall do well to pay close attention.

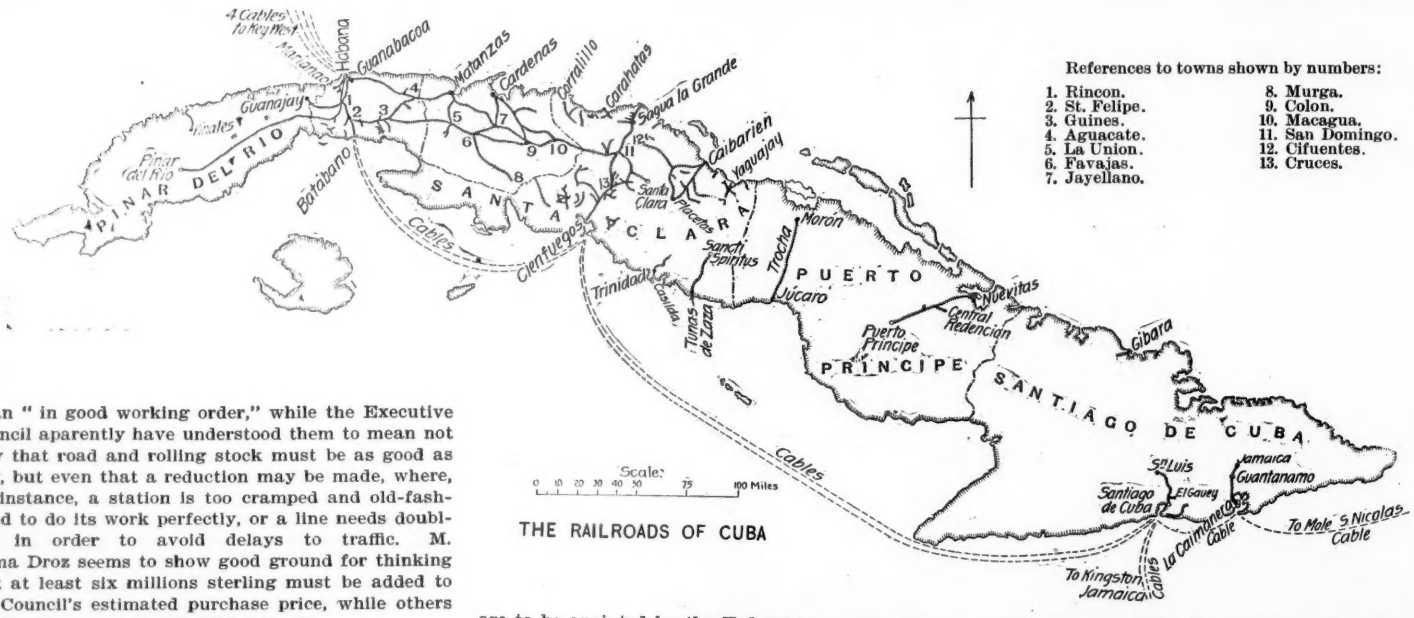
W. M. ACWORTH.

The Railroads of Cuba.

The sketch map of Cuba shown herewith indicates the location of the railroads of that country as nearly as they can be shown in view of the smallness of the scale and the limited information in the latest maps. The basis of this sketch is the last map published by Rand, McNally & Co., which seems to have been made in 1892; but corrections have been made, so far as practicable, from data found in the large and elaborate map issued by the War Department a few months ago.

Data concerning the length, ownership and equipment of the railroads of Cuba is meagre, and we have practically none that is both recent and authentic; we have, therefore, not attempted to give the names of all terminal points and junctions, but only such as are well known or can be unmistakably made out from the information at hand.

The numerous very short isolated lines, and groups of lines, are mostly the private railroads of sugar plantations. These are generally narrow gage. As will be seen from the list given below, there are a number of narrow gage branches belonging to the prominent companies; but speaking of the railroads generally, it may be said that they are all of standard gage, 4 ft. 8½ in.



THE RAILROADS OF CUBA

The most prominent railroad in Cuba is the United of Havana (Nos. 14 and 15 in our table). The officers of this company have Spanish names, but the securities seem to be held largely in England. The lines run from Havana eastward to Guanabacoa and Matanzas; to Bemba and to Guanacaro; from Havana south to Batabano; from Rincon (No. 1 on map) to Guanajay; from Guines (3) to La Union (5); and from Guines northeast to Matanzas. The total length of lines is 457 kilometers (284 miles).

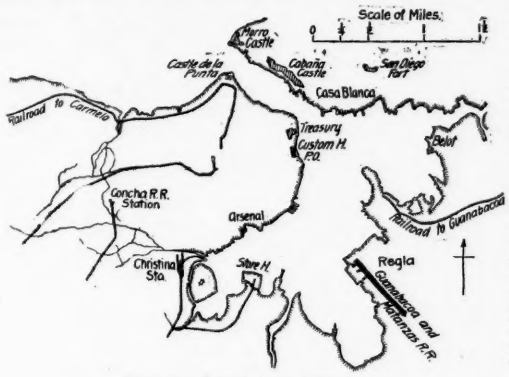
The Marianao & Havana (No. 9 in the table) is a short line westward from Havana. This is owned

The data shown in the following table is taken from the Universal Directory of Railway Officials, published by the Directory Publishing Co., 8 Catherine street, London. This directory is published chiefly to give names of officers and its data concerning distances, etc., seems, in some cases, of doubtful accuracy.

If the lengths of roads, given in our table, have been correctly copied, the total number of miles of line in Cuba is about 1,105. This, of course, does not include the plantation railroads before referred to. It is probable that considerable railroad track has been torn up during the revolution of the last three years; while, on the other hand, the War Department map shows some lines which did not appear in the map of 1892. The area of Cuba is 41,655 square miles. The population in 1890 was given as 1,631,687.

chiefly by Englishmen. There is an extension of two miles to the seacoast. The Consular report in "Highways of Commerce," issued by the State Department in 1895, states that the business of this road was mostly passenger traffic.

We give a few notes to aid in locating the other companies which appear in the table. No. 1 is in the northeastern part of Santa Clara. The principal southern terminus is Placetas. No. 3 is in the same province and extends eastward from Cardenas to Santa Clara, the capital of the province. No. 4 extends to the same capital from the southern coast. No. 5 has its headquarters at Santiago de Cuba,



Railroad Termini in Havana.

though we cannot find any line on the map equalling the length shown in the table.

No. 6, on the northern coast of Santiago province, ought, according to the table, to extend about 19 miles southward, but the War Department map shows only two or three miles. The single railroad (No. 7) at Gauntanamo also appears longer in the table than on the map.

Road No. 8 is in the southeastern part of Santa Clara. Road No. 10 extends from Matanzas southeast to Murga (8), and to Guareiras south of Colon (9).

The location of Road No. 11 is indicated by its title. Road No. 12 extends from Sagua la Grande southward to Cruces (13).

The Western of Havana (Road No. 17) is the line to Pinar del Rio.

The line running along the coast east of Santiago de Cuba is the Juragua Iron Company's Railroad. The Juragua Iron Company, Limited, is controlled by the Pennsylvania Steel Co., the Bethlehem Iron Co., and the estate of the late Alfred Earnshaw. The chief office of the company is at 1103 Girard Building, Philadelphia, and the officers are as follows: Chairman, Luther S. Bent; Secretary and Treasurer, Josiah Monroe. At Santiago de Cuba, C. William Schumann is Director, and C. H. Ziegenfuss is General Superintendent.

The line of the road is from La Cruz Point on the east side of Santiago harbor and one mile below the city, eastward via Aguadores bridge, Sardinero bridge and Jutisi bridge to Sibony, northeastward to Juraguacito and thence north to Firmeza, the mining village of the company—17 miles. It is a private railroad, used only in connection with the company's mines.

The road was begun in May, 1883, and finished July 17, 1884. The length of main track is 19 miles; sidings, 8 miles; gage, 3 ft. The rails are of steel, 56 lbs. The iron shipping pier in Santiago harbor is 575 ft. long, and there is a wooden freight wharf 170 ft. long; six bridges, one 800 ft. long, and the other five ranging from 50 to 125 ft. in length, all built of iron or steel. The company also has about 13 miles of mining track, part 2½ ft. and part 3 ft. gage, and laid with 25-lb. steel rails. Total track owned and operated by the company, 40 miles. The equipment consists of locomotives, 20; passenger cars, 1; flat and gondolas, 15; box cars, 3; ore and dirt cars, 1,729; total cars, 1,748. The quantity of iron ore hauled over the road in 1897 was 248,461 tons. Total ore hauled during the 14 years that road has been in operation, 3,145,089 tons.

RAILROADS OF CUBA.

Name of Company.	Headquarters.	Length, Miles.	Gage.	Locomotives.	Passenger Cars.	Freight Cars.
1. Caibarien	Caibarien.	37.25	4 ft. 8.5 in.	9	12	196
2. "	"	24.75	3 ft.	8	8	245
3. Cardenas & Jucaro	Cardenas	211	4 ft. 8.5 in.	49	40	1,130
4. Cienfuegos-Santa Clara	Cienfuegos	64.5	4 ft. 8.5 in.	20	23	455
5. Cuba-Sabanilla-Maroto	Santiago de Cuba	38	4 ft. 8.5 in.	4	10	34
6. Gibara & Holguin	Gibara	18.75	3 ft	3	4	16
7. Guantanamo	Guantanamo	22.4	4 ft. 8.5 in.	7	7	81
8. Las Tunas a Sancti Spiritu	Santo Spiritus	24.25	4 ft. 8.5 in.	4	5	37
9. Marianao & Havana	Havana	9	4 ft. 8.5 in.	5	23	35
10. Matanzas	Matanzas	170	4 ft. 8.5 in.	47	29	1,070
11. Puerto Principe & Nuevitas	Puerto Principe	45.4	5 ft.	10	8	93
12. Sagua la Grande	Sagua la Grande	70	4 ft. 8.5 in.	23	21	546
13. " "	" "	9	2 ft. 6 in.	3	2	40
14. United of Havana	Havana	227	4 ft. 8 5 in.	78	89	1,819
15. " "	"	11	2 ft. 6 in.	3	54	
16. Urbano	"	12.5	4 ft. 8.5 in.	11	67	5
17. Wes'ern of Havana	"	110	4 ft. 8.5 in.	21	20	219

Swaging Locomotive Boiler Tubes.

A committee consisting of Messrs. E. A. Miller of the New York, Chicago & St. Louis; J. N. Weaver of the Lehigh Valley, and A. Vail of the Western New York & Pennsylvania, made a report on the above subject at the May meeting of the Central Railway Club. The points considered were, first, whether it is advisable to swag the ends of the tubes in the firebox of locomotives, and, second, whether it is best to anneal the copper ferrule thoroughly before applying in either case. The following is taken from the report:

Mr. J. N. Weaver states that his experience since 1865 has been continuously with the Lehigh Valley Railroad, and from that date, at least, it has been the practice to use copper ferrules on the back of boiler tubes. At that time and up to 1869, they turned the end of the tube slightly taper and bored the ferrule after it was brazed together, and then brazed it on the end of the tube before setting it in the boiler, using copper to finish, about $\frac{1}{16}$ in. thick. This was a very expensive method. About 1869 they cut the ferrules from sheet copper in strips of the proper length and width, and simply scaffed the ends and did not braze them together, and also adopted the plan of swaging the end of the tube, using copper $\frac{1}{16}$ in. thick. Later on they continued to swage the flue, making the ferrules in the same manner, except that copper $\frac{1}{64}$ in. thick was used. Mr. Weaver's idea is that as there is an unequal expansion in copper and iron, the thinner the copper ferrule the less the joint will be effected from that cause, and all that is required of the copper is a joint between the two iron or steel surfaces. He approves of swaging the end of the tube all that the conditions will permit of, as it saves the metal in the tube and avoids excessive rolling with the expanders in its first application. The present practice of the Lehigh Valley is, for 2 in. tubes, to bore the back sheet $1\frac{31}{32}$ and swage the tube on that end, so as to take a copper ferrule decimal gage .065 thick, and braze the ends, making same one-eighth of an inch longer than the thickness of the tube sheet, and drive it flush with the outside of the sheet, so that the beading of the tube will cover the copper.

Mr. A. Vail, General Master Mechanic Western New York & Pennsylvania, states: That as far as the swaging of the firebox end of locomotive boiler tubes is concerned, they have used them both ways; and as to the durability of boiler tubes that were swaged, and those that were not, they could not see any difference. Of late years their practice has been to swage all of their boiler tubes, and when copper ferrules are used, it gives a little more metal between the tube holes, which is quite important to the strength and wear of the tube sheet. They use copper ferrules on all locomotive boiler tubes on the firebox end, and have a few engines with copper ferrules on the front ends of tubes. They do not anneal copper ferrules, and prefer not to do so, as the copper is soft enough without annealing. The thickness of copper ferrule is No. 16, English wire gage.

The New York, Chicago & St. Louis has used both swaged and non-swaged tubes in the firebox end, with results as follows:

Engine—	Date. From.	To.	Kind.	Miles run per set flues.
75	3-13-88	10-21-91	Swaged	94,925
76	3-16-88	1- 9-93	"	80,586
80	8-13-88	9- 3-90	"	76,517
81	8-17-88	8-30-97	"	75,055
104	9-22-92	10-20-94	"	42,486
107	5-10-95	2-18-96	"	45,088
75	10-11-93	9-12 97	Non-swaged	91,904
76	9- 7-93	1- 1-98	"	63,418
80	8-11-94	9-22-97	"	87,750
82	5-21-94	11-30-97	"	78,552
104	12-21-94	2- 5-96	"	63,213
107	4- 8-96	7-19-97	"	65,497

The present practice is to use 2-in. No. 12 (110 Dec. gage) tubes. These tubes are not swaged or annealed. Copper ferrules .065 thick decimal gage are used on firebox end.

They claim for the straight or not swaged tubes the following advantage: The saving of expense in labor of swaging and annealing; a difference of about 70 sq. in. in area in favor of the tubes not swaged (in a set of 200 tubes) which in itself ought to be of some benefit; a larger average mileage per set in favor of the non-swaged tubes. While it is claimed by foremen that the swaged tubes clog or fill up more frequently than those that are not swaged, there is no data to show this definitely. Copper ferrules are not annealed before applying.

The Pennsylvania Class H-5 Engine.

We published June 10, page 401, a description of that very interesting engine, the Class H-5 consolidation of the Pennsylvania Railroad. After that description was published we received from Altoona certain corrections in the earlier figures which had been given to us. Below will be found the figures as published and the figures as corrected at Altoona. The weights which appear in the latter column are the actual scale weights.

	As published.	As corrected at Altoona.
Tubes, number	306	369
" outside diameter	2¼ in.	2 in.
" heating surface, sq. ft.	2,524	2,720
Total " " "	2,721	2,917
Weight, working order, lbs.	208,000	198,000
" on first drivers	46,000	43,000
" " second "	46,000	44,000
" " third "	48,000	46,000
" " fourth "	46,000	44,000
" " truck "	22,000	21,000

The ratio between theoretical tractive power and the weight on drivers is 26, and not 25, as given in our description.

Some Phases of the Rapid Transit Problem.*

By Albert H. Armstrong.

The rapid transit problem, in congested districts, has to deal with the transportation of passengers at a high average speed with frequent stops, and even in suburban traffic where the stops are less frequent, the schedule speeds have been so increased by the ability of the electric motor to accelerate rapidly, that trains hardly reach full speed before it is necessary to apply the brakes. As running at a constant speed does not occur in rapid transit service where stops are at all frequent, it becomes of the greatest importance to carefully investigate the subject of train acceleration, in order to determine the method of running a train from station to station with the least expenditure of energy.

Problems in train acceleration may be divided into two broad classes: 1.—Where the road is level, and 2.—Where grades exist or where an artificial profile is made in order to take advantage of down grades at starting.

Modern passenger cars demand a dead weight of approximately 550 lbs. for each passenger carried, or, in other words, only 20 per cent. of the total weight of a loaded motor car is a paying load. When it is considered that in rapid transit service with frequent stops, over 80 per cent. of the total energy output of the motive power on level roads is required to accelerate the train, it is evident that in this class of service the rolling stock requires the greatest attention.

To avoid undue complication, the following discussion has assumed that train friction is a constant quantity at all speeds, as at the low maximum speeds—20 to 30 miles per hour—reached in practice with frequent stops of two or more per mile, the error introduced by assuming a constant friction rate will be small, and will not at all alter the conclusions arrived at.

The following constants have been assumed as representing average operating conditions:

Length of run, 2,000 ft. Length of time train is in motion, 75 seconds. Schedule speed, 16.05 miles per hour, including 10-second stops, or 85 seconds total time.

Tractive effort, 100 lbs. per ton total, to be maintained uniform during acceleration of the train. Braking effort, 150 lbs. per ton constant throughout the period of braking.

The train friction being 15 lbs. per ton, reduces the effective accelerating force from 100 to 85 lbs. per ton, corresponding to a rate of .927 miles per hour per second.

With this data a simple acceleration curve, as in Fig. 1, may be calculated, the train reaching a maximum speed of 28 miles per hour in 30 seconds, when power is shut off and the train allowed to coast with a retardation due to friction of .1635 miles per hour per second for 31 seconds to the braking line, when it is retarded at a uniform rate of 1.635 miles per hour per second and comes to rest in 75 seconds from time of starting.

Owing to the greater efficiency of the run, the train is allowed to coast after reaching its maximum speed rather than to allow it to continue at a uniform speed with just sufficient power supplied to overcome the train friction loss.

It is obvious that the train could be accelerated at a different rate than that corresponding to 70 lbs. per ton and still make the same length of run in the same time, the length of time occupied in coasting depending upon the rate of acceleration, being a maximum with an infinite rate, that is, with the train starting with a certain initial velocity. A minimum rate of acceleration is reached when no time is left for coasting; that is, when brakes are applied as soon as power is shut off.

In Fig. 2 such a set of curves has been prepared showing a train covering a distance of 2,000 ft. in 75 seconds, as before, but accelerating at various rates from that corresponding to 62.8 lbs. per ton as a minimum up to an infinite rate, or starting with an initial velocity of 25.2 miles per hour.

As the area inclosed by time as abscissae and speed as ordinates represents the distance covered, this will be a constant quantity for the fixed distance of 2,000 ft. assumed, and curves of Fig. 2 are thus constructed with the same inclosed area for each rate of acceleration. The fact is plainly brought out that with a low rate of acceleration a much higher maximum speed is demanded than would be the case if the rate had been increased and a curve may be plotted by joining the maximum speeds reached for different accelerating rates, as shown.

A friction of 15 lbs. per ton has been chosen as being that of an average train composed of a motor car and three or four trailers and weighing about 120 tons. With heavier and longer trains this rate may be reduced to as low as 7 or 8 lbs. per ton, while for a motor car alone, the rate may be as high as 30 lbs. per ton, due to friction of motors and gearing. The braking effort of 150 lbs. per ton is also chosen as representing what can be done on an average by a train equipped with air brakes and operating at half the slipping coefficient of the wheels.

It is advisable in rapid transit service to keep the maximum speed reached by the trains as low as possible, as this class of work generally calls for a short time interval between trains, where the utmost precautions are necessary to keep the trains a safe distance apart. In fact, the maximum speed required for a given run practically determines the time interval between trains, as the train headway should be at least five or six times the length of time required to bring a train to rest from its maximum speed with normal braking force applied.

* Presented at the Fifteenth General Meeting of the American Institute of Electrical Engineers, Omaha, June 28, 1898.

A second reason for higher rates of acceleration lies in the fact that with rates of acceleration approaching the minimum no margin is left for errors of judgment of the motorman, as little or no time is left for coasting, and the rate of acceleration per ampere input is continually varying with the changing passenger load and hence with an overload it becomes difficult to maintain schedule speed.

A third and most important objection to the use of a low rate of acceleration lies in the saving of energy for the run by the use of a higher rate.

Neglecting $I^2 R$ and core losses of the motors, a set of energy input curves per ton weight of train may be plotted as in Fig. 2, assuming for simplicity that motors are series wound, operate all in multiple and are so geared that starting resistance is entirely cut out at the various maximum speeds reached in the various runs; that is, that no accelerating is done on the motor curve. A constant impressed E. M. F. is assumed, and starting resistance is supposed to be cut out proportional to the motor speed, thereby keeping the current and torque constant.

Thus it is seen that accelerating a train with the minimum rate calls for the highest maximum speed, demands nearly the least current input and also demands the greatest waste of energy in the brakes, as the speed is a maximum when brakes are applied.

128 seconds for 2,000 foot run. That is, a train accelerating with an infinite rate and coasting the entire length of 2,000 ft. would come to rest in 128 seconds with no energy loss in the brakes, and any longer interval of time occupied in the run would require some finite rate of acceleration at a maximum. This is pointed out in Fig. 3, where for a run in 210 seconds the maximum rate of acceleration possible is .175 miles per hour per second, corresponding to 24 lbs. per ton. No train in practice would require such a long time as 210 seconds, nor would it be possible to make a run of 2,000 ft. in 41 seconds, but these curves have been carried out to show the limits for a given set of conditions.

As the energy lost in braking is proportional to the square of the speed when the brakes are applied, the curve A—B, Fig. 3, being the locus of the minimum rates of acceleration, that is, with no coasting, is thus the curve of maximum input for a run of 2,000 ft. for any length of time. Also the curve C—D, being the locus of the various coasting lines, that is, of no braking effort, is thus the curve representing the minimum possible input.

To compare the amounts of energy required for rates of acceleration other than the maximum and minimum a set of curves has been prepared in Fig. 4 giving the energy consumption for a run of 2,000

All previous curves have been based upon the assumption that trains are allowed to coast after reaching maximum speed and also that acceleration is carried on at a perfectly uniform rate until power is shut off; but in practice this assumption may be modified somewhat, the starting resistance being cut out before the maximum speed is reached, and the latter part of the acceleration carried on at a constantly decreasing rate upon the motor curve.

Another method would be to accelerate at a constant rate until maximum speed is reached, then continue this speed constant by supplying motors with just sufficient power to overcome train friction. This latter method of train acceleration, however, demands such a considerable increase in the amount of energy required for the run that it has not hitherto been considered.

The three methods of acceleration are illustrated in Fig. 5, showing the three forms of speed curves, a—a accelerating at a constant rate and coasting after maximum speed is reached until brakes are applied, b—b accelerating at a constant rate and continuing at full maximum speed until brakes are applied, and c—c accelerating at a constant rate until starting resistance is cut out and further acceleration allowed to continue at a constantly decreasing rate with constant full line potential at motor terminals until

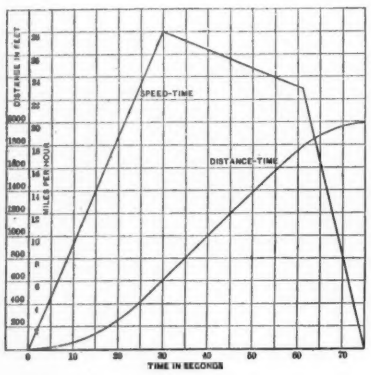


Fig. 1.

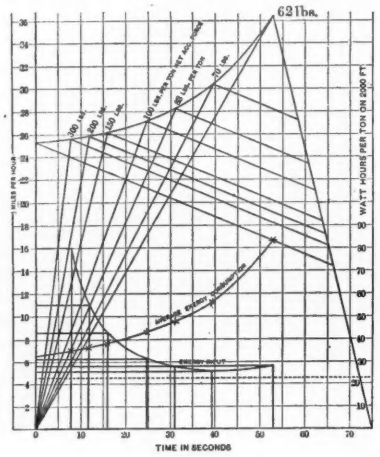


Fig. 2.

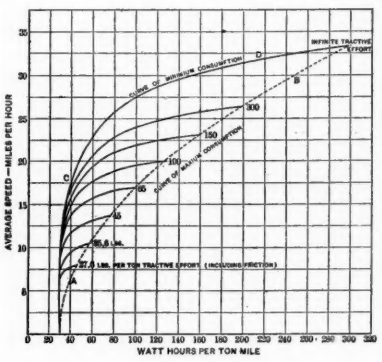

INFINITE TRACTIVE EFFORT
CURVE OF MINIMUM CONSUMPTION
CURVE OF MAXIMUM CONSUMPTION
AVERAGE SPEED — MILES PER HOUR
WATT HOURS PER TON MILE

Fig. 4.

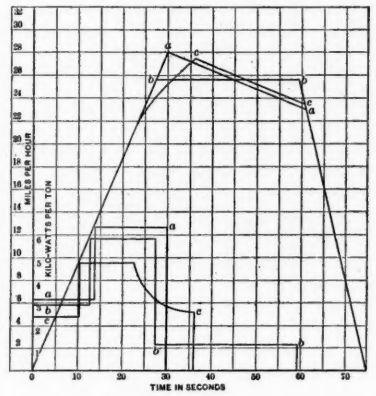


Fig. 5.

Acceleration and Energy Curves in Rapid Transit Service.

The areas inclosed by the various energy time curves represent the comparative amounts of energy required for the run for the different rates of acceleration and these are plotted in Fig. 2, which compares the energy input and the average energy consumption for the run of 2,000 ft. in 75 seconds for all rates of acceleration from the minimum, corresponding to 62.8 lbs. per ton, up to infinity.

For convenience the average energy rates are plotted in terms of watt hours, and the curve shows that while the minimum rate of acceleration corresponding to 62.8 lbs. per ton calls for an expenditure of 83.5 watt hours per ton weight of train, this is reduced to 55.5 watt hours by accelerating with a rate corresponding to 70 lbs. per ton, to 42.7 watt hours with 100 lbs., and finally reaches a minimum value of 32.5 watt hours if the accelerating rate is pushed to infinity.

Thus the energy required for the run of 2,000 ft. in 75 seconds may vary from 83.5 to 32.5 watt hours per ton of train weight, a decrease of over 60 per cent., depending upon the rate of acceleration used.

The curves in Fig. 2 are worthy of careful study, and similar curves afford a means of determining the proper rate of acceleration, and hence motor equipment, gearing, etc., to use for a given set of conditions. The limiting factor in the more rapid rate of acceleration of a train is the current input required. Thus, if the rate of acceleration be carried to abnormally high values, the local demand for current becomes so great that either the loss in the feeders more than offsets the reduction in energy consumption at the train, or else the interest on the increased feeder investment is not offset by this energy reduction.

There are other limiting factors governing the rate of acceleration in the size and weight of motors, which are limited in the current they can carry without undue sparking and heating. Thus it will be found that the rate at which a train accelerates largely determines the cost of feeders, size of motors and generators, both in regard to current and thermal capacity, and also fixes the safe headway between trains.

The error made in accelerating at or near the minimum rate is clearly brought out. For example, the current consumption per ton is the same for 62.8 lbs. per ton or 85 lbs. per ton; as, although 85 lbs. calls for the greater tractive effort, the torque per ampere is so increased by the lesser maximum speed demanded that the current input is the same in each case, hence the feeder considerations are the same in both cases, while the energy consumption shows a reduction from 83.5 watt hours per ton with 62.8 lbs. to 47.5 watt hours, or about half, with 85 lbs. per ton.

Referring again to Fig. 2, it is obvious that a similar set of curves may be plotted for a run of 2,000 ft. for any other length of time than 75 seconds, and Fig. 3 gives such a set of curves plotted for lengths of time ranging from 41 seconds, as a minimum possible, up to 210 seconds. The minimum time in which it is possible to make a run of given length is determined by the braking effort, in this case assumed to be 150 lbs. per ton, the train reaching a maximum speed of 66.5 miles per hour in zero seconds, with an infinite accelerating force and being retarded throughout the entire running time of 41 seconds at the rate of 1.635 miles per hour per second, corresponding to a force of 150 lbs. per ton braking effort.

The constants assumed in these curves are the same as before, 15 lbs. per ton friction rate, and 150 lbs. per ton braking effort applied uniformly until the train comes to rest at a distance of 2,000 ft. from the start. While the braking effort determines the minimum length of time for the run, the friction rate imposes a limit upon the maximum rate of acceleration possible for lengths of time greater than

ft. on a level track for any rate of acceleration and for any length of running time, the constants being 15 lbs. per ton friction rate and 150 lbs. per ton braking effort. For convenience in comparison the energy consumption is reduced to watt hours per ton mile, and speed is expressed as average speed in miles per hour while train is in motion or equaling schedule speed if the train loses no time in stopping. The dotted curve A—B is the maximum energy curve corresponding to the curve A—B of minimum rates of acceleration in Fig. 3, and the curve C—D represents the minimum amount of energy possible for the different speeds and is described by an infinite rate of acceleration.

The curves of maximum and minimum energy consumption approach each other and coincide at a speed of 33.3 miles per hour, corresponding to an energy consumption of 298 watt hours per ton mile, this value being the greatest amount of energy that can be expended on the run with 150 lbs. per ton braking effort.

All energy values are net, that is, they represent the amount of energy required to accelerate the train plus energy lost in overcoming friction, and

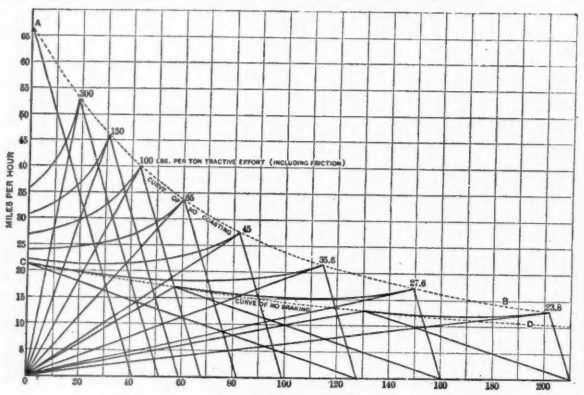


Fig. 3 —Acceleration Curve for Different Lengths of Time.

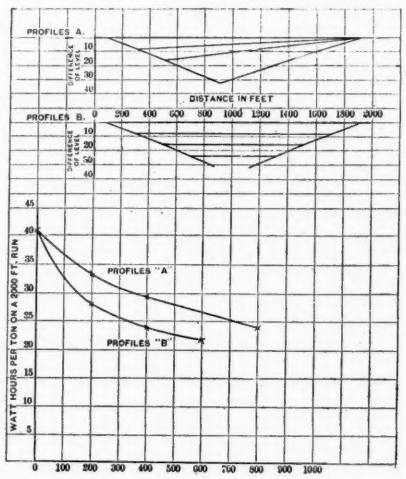


Fig. 6 —Energy Consumed for Different Profiles

hence take no account of any losses occurring in actual operation in the motors, rheostats, gearing, etc.

Fig. 4 shows the economy resulting from properly proportioning the accelerating rate of the schedule speed and distance traveled. For example, a train accelerating with a tractive effort of 100 lbs. per ton and making 20 miles per hour average speed, not including stops, will require 127 watt hours per ton mile, which would be reduced to 65 watt hours per ton mile if the tractive effort had been increased to 150 lbs. per ton, or, in other words, the generator capacity would be but half as large for the same service.

The curve of 300 lbs. per ton tractive effort is interesting, as it represents about the maximum speed attainable with modern apparatus for a distance of 2,000 ft. with the assumed constants of friction and braking effort. Assuming the entire weight of the car to rest upon drivers, about 300 lbs. per ton would be available for traction without slipping the wheels on an average track, so that an average speed of 26½ miles per hour is the highest that could be obtained over a distance of 2,0000 ft., not allowing any time whatever for coasting.

a. Constant current and coasting, 147 watt hours per ton.

b. Constant current and no coasting, 160 watt hours per ton.

c. Constant current and acceleration on motor curve, 126 watt hours per ton.

Hence, of the three methods, curve c, making use of the acceleration due to a series-motor curve, not only requires the least maximum current input, but also requires the least average energy input to the motors for a given run, and hence is the form of curve used in the majority of actual runs. Although the energy given out by the motors in run c is greater than in run a, as evidenced by the higher speed at which brakes are applied, yet this extra work is done so much more efficiently, owing to the smaller starting resistance loss, that the total watt hours input becomes less.

Whatever form of acceleration curve be used, the results arrived at in Fig. 4 will not be greatly modified if similar forms of curves are compared, and, being expressed in terms of actual work done, may be used for any run with a factor expressing the efficiency of acceleration; that is, the ratio of actual work done to the total energy input.

It will be noted that all curves of Fig. 4 approach a minimum value of 30 watt hours per ton mile; that is, the minimum energy expressed in watt hours per ton mile expended for a given run will be double the friction rate. The actual factor is 1.98 and forms a very convenient method of determining the net energy consumption for any speed and train weight if the friction rate be known. Thus, assuming the light load efficiency of a railway motor, including gear loss, to be 75 per cent., a friction rate of 15 lbs. per ton would demand an input of 40 watt hours per ton mile, corresponding to an input of 1,200 watts per ton weight of train at, say, a constant speed of 30 miles per hour.

A number of interesting conclusions may be made from the foregoing investigation of the operation of trains upon a level track.

1st. The rate of acceleration determines the energy consumption for a given run, and since this energy consumption decreases with increased rate of acceleration, the train should be brought up to speed as quickly as possible and allowed to coast to secure the minimum energy input.

2nd. The maximum current input during acceleration increases with the rate of acceleration, and hence limits the rate at which a train can be accelerated with a given feeder loss or feeder investment.

3rd. In order to reduce the average energy consumption and also the maximum current input to a minimum for a given run, a due amount of acceleration should take place on the motor curve after starting resistance is cut out; hence a motor should be carefully proportioned for the work it has to do.

4th. A normal amount of coasting should be permitted after power is shut off, partly to provide a margin to allow for errors of judgment of the motorman, but largely because this is the most efficient method of accelerating a train. On no account should the maximum speed be continued by supplying the motors with just sufficient current to overcome train friction, as this method of accelerating is extremely wasteful and inefficient.

Having discussed various methods of accelerating, it is interesting to follow out the problem, and determine the actual efficiency of transporting passengers by our modern methods of travel. It has been pointed out that only from 15 to 20 per cent. of a fully loaded train consists of a paying load, and with an average load as carried throughout the day this percentage will be reduced to 10 per cent. or less, that is, nine-tenths of the energy consumed in moving this train at a constant speed is wasted. But in rapid transit work a train seldom attains a constant speed, due to the frequent stops and high schedule speed, and at least ten times the energy required to overcome friction alone must be expended in accelerating the train, only to appear as heat in the brake shoes when bringing the trains to rest. That is, considering the friction work of the train as the only useful work done, an efficiency of only 10 per cent. is reached in the average run. But only 10 per cent. of this friction work is useful in moving passengers, hence the actual passenger efficiency is reduced to less than one per cent. of the total energy delivered to the train during acceleration.

When it is considered that further losses occur in operation in the motors and their method of control, in the transmission lines and generators of an electric traction system, it will be appreciated that the present method of transportation, with its efficieny of a fraction of one per cent., opens a wide field for improvement. This applies with greater force to rapid transit service using steam locomotives as a motive power, as the dead weight carried per passenger is greater with a steam locomotive than with a motor car, and the efficiency from the coal pile is much less. Hence some means of reducing the large loss, due to accelerating the train, is desirable, and this found in the adoption of an artificial profile, as followed out in a large underground road now building, using down grades in starting, and up grades to retard the train when stopping.

The ideal profile would provide for a down grade at starting sufficient to do the work of acceleration and with an up grade to do the entire braking required, thus leaving only the friction energy to be supplied by the motive power. Such a road would operate at 100 per cent. efficiency, neglecting the dead weight of train carried and considering total friction work as useful work.

Reduced to practice, this ideal grade must be modified considerably. The per cent. grade used is limited partly by the rapidity of acceleration that may be imparted to the train without discomfort to the passengers and partly by the available tractive effort of the motive power, which must be sufficient to haul the train up the grade in case of necessity.

A second modification occurs in the necessity of having stations placed on a level track, and since a train has an appreciable length, it must travel its own length before the last car is off the level and the full effect of the grade is felt. Thus, during the first period of acceleration the rate is comparatively small and must be furnished by the motors, resulting in a material reduction in the energy gain in the theoretically ideal profile. An artificial profile can only be secured on elevated or underground roads, and a double track road necessitates two separate overhead structures and the underground road must consist of two separate tunnels with unlike profiles.

Assuming two stations to be on the same level, there are two forms of profile that may be assumed with a given maximum difference in levels, as shown in Fig. 6. Profile A consists of a down grade with a level track at each terminus equal to the length of train operating over the road, while profile B consists of a down grade and up grade equal in length and percentage with a level track connecting them, and also a level track at each station equal to a train length.

In practice a perfectly symmetrical profile, as in B, will not be possible, as the level tract connecting grades must be replaced by a slight grade to provide for drainage in tunnel roads, this grade preferably opposing the direction of movement of the train.

In order to ascertain the behavior of a train upon

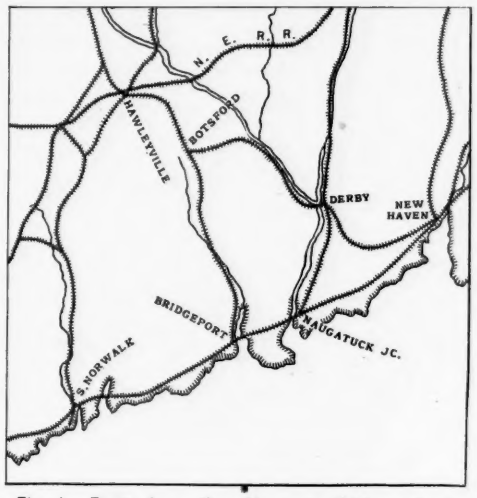


Fig. 1.—Route from New Haven to Bridgeport, via Botsford.

the two forms of profiles and to determine the most efficient form of grade, a series of curves have been plotted upon the following assumptions:

Length of run total, 2,000 ft. Train friction, 15 lbs. per ton constant. Braking effort, 150 lbs. per ton during time brakes are set. Running time, 75 seconds.

Length of train, 200 ft, corresponding to an average train of four to five cars.

Tractive effort, as supplied by motors, 100 lbs. per ton. (This effort being supplied irrespective of added effort due to grades.)

No running is assumed to take place on the motor curve, and train is supposed to coast after reaching maximum speed.

Motors are controlled by the ordinary series-parallel method, starting with two motors in series and throwing them into multiple, the starting resistance being supposed to be cut out uniformly so that 100 lbs. per ton motor effort is maintained constant while current is on.

Due regard is paid to the fact that the tractive effort due to grade depends upon the proportional length of train off the level track at the stations, and hence is a constantly increasing quantity until the entire train is on grade.

A grade of 4 per cent. has been chosen for the down grade in A, and for both down and up grades in B; and energy consumption plotted in Fig. 6 for different lengths of grade.

Thus for a run of 2,000 ft. in 75 seconds, the energy input with series-parallel control is 40.75 Watt hours per ton for a level track, which is reduced to 27.8 watt hours in curve A with a length of 500 ft., 4 per cent. grade and 22.6 watt hours per ton in C, with the same length of 4 per cent. grade, that is, with the same vertical fall.

A length of 500 ft. of 4 per cent. grade calls for a vertical fall of 20 ft., which is not excessive in practice, hence by the use of a profile similar to B, Fig. 6, the energy consumption for a given run may be reduced as much as 40 to 50 per cent. from that required on a level track.

With proper proportioning of the gear ratio of the motor, allowing some acceleration on the motor curve, this saving in energy consumption could even be exceeded, so that a rapid transit road, especially a tunnel road, properly laid out with an artificial profile, could operate with a very much less energy consumption than an existing surface road.

In conclusion it may be pointed out that the electric motor is eminently adapted to rapid transit service, owing to its ability to accelerate rapidly; and for tunnel work especially it has no rival, adding to its high efficiency of operation its perfect immunity from smoke and gases.

A Blockade on the New York, New Haven & Hartford.

On the night of Tuesday, June 21, the double track bridge which carries the New York Division of the New York, New Haven & Hartford over the Housatonic River, at Naugatuck Junction, five miles east of Bridgeport, was damaged by a derailment of freight cars to such an extent that both tracks were made unsafe and traffic had to be suspended about 41 hours, trains being run around 39 miles to accomplish the 13 miles between Bridgeport and New Haven.

Considering the location, and the character of the traffic over this line, this was one of the most serious passenger blockades that has happened for a long time. This is practically the only railroad line between New York and Boston. The whole of the New York Division is a four-track railroad, except a few miles at Bridgeport and at a few bridges, and there were 27 heavy trains moving on the division, to be taken care of at the time the blockade began. On Wednesday, the day following the derailment, there were large numbers of passengers from New York bound for the boat race at New London, making a material addition to the heavy ordinary traffic. A blockade like this, on other lines which are important enough to be compared with the New York Division, would be very unlikely to inconvenience the public so much as did this one. On the New York Division of the Pennsylvania, for instance, the loss to the railroad company would indeed be equally serious, but passengers and perishable freight could find an entirely adequate outlet over the parallel line of the Reading and the Central of New Jersey.

The only business of which the New Haven could relieve itself was that to and from Boston by way of Springfield or Hartford. The through express trains over the Boston & Albany were sent by way of South Norwalk and Hawleyville over the New England road. Some freight was sent through to Boston by way of Hawleyville and the New England road. All of the through passenger business that could not be dealt with by this route was run between Bridgeport and New Haven by way of Botsford, 39 miles, single track. A few of the accommodation passenger trains were run to the bridge on each side and the passengers walked across on foot, but this was a slow process, and was not attempted with heavy trains.

The derailment occurred in a long westbound freight train, about 9.20 p. m. A drawbar was pulled out of a car shortly before the train reached the bridge, and five or six cars were thrown crosswise of the track and wedged between the trusses on the westerly half of the draw. There is some evidence that a brakeman fell upon the track about 1,500 ft. east from the switch marked Z on the plan, Fig. 2, and that this caused the derailment, but whatever the remote cause the immediate trouble at the bridge was caused by a loaded freight car which was practically pulled apart by an excessive strain on the front drawbar. One of the derailed cars ran against the signal tower on the south side of the line, knocking out a part of the lower story.

The situation at the scene of the accident and the behavior of the cars are indicated on the accompanying drawings, Figs. 2 and 3. The train apprached on Track W. The wreck was cleared off the tracks in about six hours (one car having to be cut in two before the others could be removed), and one or two trains were moved over the eastbound track, but the deflection of the trusses showed such serious weakness that both tracks were declared unsafe.

A complete examination of the bridge showed that posts Bb and Ee, Fig. 3, were bent out of line anywhere from 20 to 36 inches, and the lower chord broken in two at points b and c. At point b, on the inside, the chord had separated about one inch, and on the outside considerably more, and at point c in the chord it was cracked outside and in, but was only discovered by close examination. The counter rods Cb were badly bent close to the turnbuckles. These breaks were on the north truss. On the south truss the end post aB was somewhat bent and the diagonals cD and Cd were bent and stretched so that sections had to be cut out and splices made. Chief Engi-

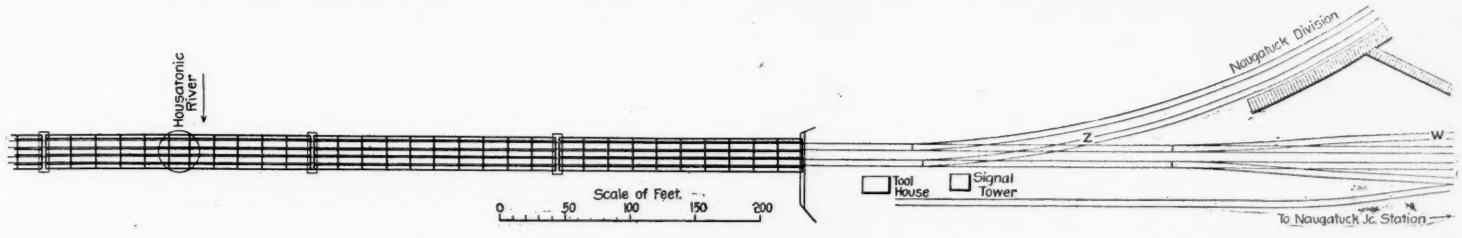


Fig 2.—Part of Bridge at Naugatuck Junction, New York, New Haven & Hartford Railroad.

NOTE: Derailment occurred at *Z*.

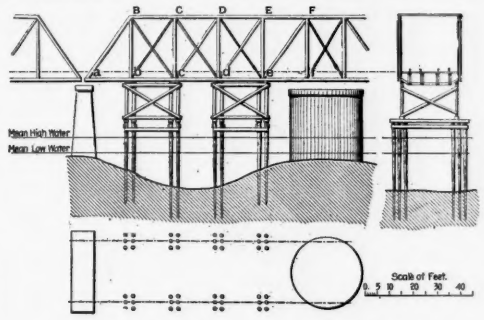


Fig 3.—Part of Housatonic River Drawbridge, New York, New Haven & Hartford Railroad.

neer F. S. Curtis reached the bridge about 4.30 a. m., and immediately ordered the necessary material to support the bridge with a timber and pile structure; and not only the truss, the lower chord of which was broken, but the whole westerly span of the draw. Piles 40 to 50 ft. long were put in under either end of each floor beam, and sawed off about 20 ft. below the bridge, tied together with caps, crosswise as well as longitudinally, and timber bents were then constructed so that the whole weight was practically upon the pile and timber structure. This was completed so that trains were allowed to run over the bridge single track at 2.45 p. m. the 23d. Besides the damage to the trusses a large number of the angles connecting the stringers with the floor beams were torn apart.

Plans were made during the day on Wednesday by the Bridge Engineer and furnished the Berlin Iron Bridge Co., about 8 o'clock in the evening, for new posts Bb and Ee, diagonals Cb, a new portion of bottom chord about 45 ft. in length, and some 7 or 8 pairs of angles connecting the floor beams with the stringers. These were delivered to the railroad company at Berlin Friday forenoon (24th), and transported to and unloaded at the bridge site by 12 o'clock noon on the same day; and the permanent repairs were finished on the morning of June 30.

The movement of the enormous traffic of the New York Division over the single track line of the Berkshire Division was, of course, a great strain on the men and the facilities of that division, its capacity being taxed to the utmost limit throughout the 41 hours of the blockade. Superintendent J. P. Hopson informs us that for the 24 hours from Wednesday morning to Thursday morning the total number of trains moved was 123. The number of orders issued was 91, the number of trains affected by the orders being 241, each order affecting from two to nine trains. There are several bridges on this division over which the heavy engines of the main line had to be run at very low speed. From Bridgeport to Botsford there is a 49 ft. grade for the entire distance of 15 miles, and from Derby Junction to Orange, four miles of 65 ft. grade. In the other direction, New Haven to Botsford, 24 miles, there is for some distance a grade of 115 ft., and the last eight miles east of Botsford is a continuous grade of 50 ft. to the mile. About 90 per cent. of the line is on curves, some of them quite sharp, curves between 9 and 10 degrees being frequent. Besides these difficulties the large number of trains necessitated the employment of firemen and brakemen as pilots, thus increasing the burden on the train dispatcher.

The grades and curvature, necessary slowdowns for bridges, special provisions for supplying coal and water for the longer distance, in addition to the usual delays consequent upon moving trains over an unusual route on single track, made fast time out of the question. In some cases the 40 miles over the single track was run in a little over an hour, but the average time was about two hours.

The line between Bridgeport and New Haven, together with the balance of the Berkshire Division, 150 miles in all, was handled by one dispatcher. In some cases trains were seriously delayed owing to the conditions already stated, and because preference had to be given to more important through trains.

Under the existing conditions it was deemed unwise to run trains singly. They were run in groups or sections, and practically only two meeting points were used, namely—Botsford, where the main track toward Pittsfield could be used for a passing track, and at Shelton, the latter point being about half way between New Haven and Botsford. The plan of operation was to start several sections on a schedule from Bridgeport, and a similar number of trains from New Haven, each with orders to Botsford. After meeting opposing trains, they would proceed under their orders to Bridgeport and New Haven respectively.

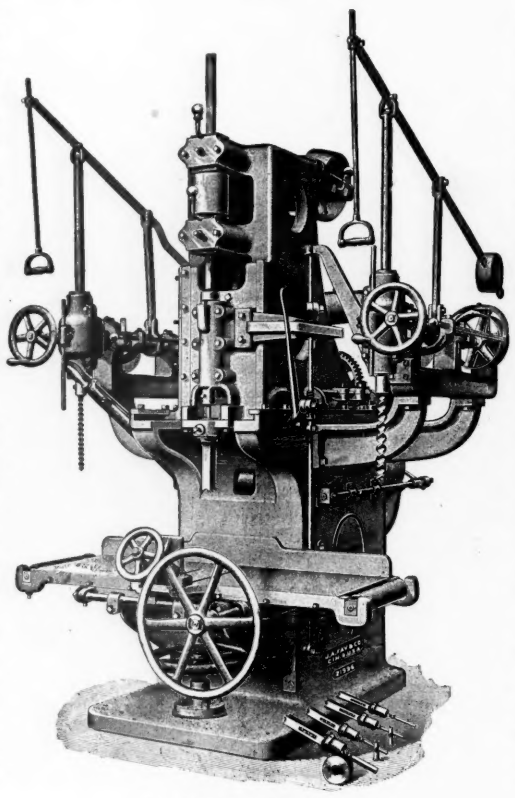
In the meantime, if further trains were sent out from New Haven they would be run to Shelton to meet the eastbound group, another group, which had been started from Bridgeport, being met at Botsford. There were no derailments or collisions, and the entire traffic was moved without any unpleasant incident other than the necessary delays.

Vertical Hollow-Chisel Car Mortising Machine.

The accompanying illustration shows the No. 4 vertical hollow-chisel car mortising machine made by J. A. Fay & Co., Cincinnati. In designing it particular care was taken to include the elements of a strong, simple and efficient machine. The frame is massive, made in a cored form with wide base, giving ample floor surface and carrying a cored housing and the auxiliary boring attachments. This housing is gibbed firmly to the frame, arrangements being provided for taking up the wear. The lateral movement is governed by a lever for the purpose of moving the chisel to its required position above the timber.

The chisel-ram is gibbed to the housing, and carries the boring spindle that prepares the material for the chisel-thrust; this boring spindle runs in a long, self-oiling bearing in the frame, and through the sleeve, bearings and pulley on the housing where the power is applied. There is a self-adjusting binder provided for always keeping the proper tension on the belt that drives the boring spindle. Stops regulate the vertical travel of the ram for the depth of mortise, and also the lateral movement for its width. The vertical movement of the ram is 16 in., and the extreme lateral motion, with the housing, is 14 in.

The reciprocating motion of the chisel-ram is produced by reversing friction and gearing. A counter



Car Mortising Machine.

shaft is placed above the machine, driving the friction by two belts.

The table for supporting the material is 4½ ft. long, and provided with an adjustable clamp for holding the material firmly in position.

Our Iron and Steel Works in 1898.*

By James M. Swank, Esq.

The fourteenth edition of the Directory to the Iron and Steel Works of the United States, Canada and Mexico is presented herewith to the members of the American Iron and Steel Association and to the whole American Iron Trade. Another edition of the Directory need not be looked for until late in the year 1900.

The present edition embraces 396 printed pages, 62 pages more than the edition of 1896. The increased size of the volume is due to the enlarged description of many of the rolling-mill, steel-making, and other plants heretofore described in the Directory; to the erection in the last two years of new furnaces, rolling mills, steel works, and tinplate plants; and to the addition of many lists of consumers of iron and steel that have not appeared in previous editions. The edition of 1896 contained complete lists of all the blast furnaces, rolling mills, Bessemer steel works, open-hearth steel works, crucible steel works, plate and sheet mills, cut-nail works, tinplate works, stamping works, forges and bloomaries, wire-rod and wire mills, wire-nail works, iron and steel bridge-builders, iron and steel shipbuilders, horse-nail works, locomotive works, malleable iron works, cast-iron pipe works, wrought-iron and wrought-steel pipe works, car-axle works, car-wheel works, and carbuilders in the United States; also a list of the iron and steel works in Canada and Mexico. To these are now added complete lists of the rail mills, structural mills, steel casting works, bolt, nut and rivet works, chain works, seamless tube works, skelp mills and riveted pipe works. The names and location of all the works described are given in alphabetical order, followed usually by a description of their character, capacity, and products, with the names of the principal officers, etc., including the names of selling agents. A table of contents and indexes to the names of firms and companies, the names of works, and brands of pig iron will assist the reader in promptly turning to any desired information. The body of the volume has been corrected to April, 1898, but a supplementary chapter brings down all information to June. We have not anticipated a few changes in ownership, which we are advised will occur after June, as the object of the Directory is to record only accomplished facts.

*Extracts from Preface to the Fourteenth Edition of the Directory to the Iron and Steel Works of the United States, to be published by the American Iron and Steel Association, July 4, 1898.

Blast Furnaces.—In the present Directory we have adopted a new method of indicating the furnaces that are really active or that are undoubtedly entitled to be counted in the active list. At the end of every blast-furnace description we mention when the furnace or furnaces referred to were last in operation.

In the edition of 1896, more than in any of its predecessors, we pruned the blast-furnace list of all recently abandoned furnaces and of all long idle furnaces. There remained 469 furnaces in the so-called active list of that year, or just 100 less than in 1892. In the present edition, after still more throroughly eliminating recently abandoned or long idle furnaces, and after allowing for new furnaces built since the directory for 1896 appeared, we enumerate only 420 furnaces in the so-called active list. Of these furnaces we feel sure that about 50 will never make another ton of pig iron; so that we have to-day in this country not more than 370 furnaces that are either active or are likely to become active at any time in the future. But most of these are thoroughly equipped modern furnaces, and many of them are furnaces of great capacity.

The total annual capacity of the 469 furnaces that were described in the edition of 1896 was 17,373,637 gross tons, and the average annual capacity of the furnaces was 37,044 tons. In the present edition the total annual capacity of the 420 furnaces that are described is 19,081,587 tons, and their average annual capacity is 45,432 tons. As already stated, there are probably 50 furnaces in the present list of 420 furnaces that in our opinion will never run again, because they are antiquated or badly situated, so that a perfectly fair estimate of the actual capacity of the completed furnaces in this country to-day will place it in round numbers at about 18,000,000 tons.

Included in the total number of completed furnaces now described are 8 new furnaces using bituminous fuel and one using charcoal which have been built since the appearance of the edition of 1896, namely, the 4 magnificent furnaces of the Carnegie Steel Company, Limited, at Duquesne; the large furnace of the Punxsutawney Iron Company, at Punxsutawney, Pa.; the almost equally large furnace of the Union Iron Works, at Buffalo, N. Y.; the large Steelton Furnace of the King, Gilbert and Warner Company, at Columbus, Ohio; the Milton Furnace of the Wellston Iron and Steel Company, at Wellston, Ohio; and the Pioneer Furnace (charcoal) of the Cleveland-Cliffs Iron Company, at Gladstone, Michigan.

In addition to the 420 completed furnaces that are now described mention is made of 4 furnaces that were in course of erection in April last, while 8 others were either projected or partly built and work upon them had been suspended. Of these 8 furnaces only one, Carnegie Furnace, at Johnson City, Tennessee, is likely to be put in blast in the near future. The 4 furnaces that are mentioned as in course of erection in April last will probably be completed this year. They are all to be large furnaces. The Reading Iron Company is building one at Reading, to be 80 by 17 feet, with an annual capacity of 75,000 tons. The Oliver and Snyder Steel Company is building a new furnace at Allegheny to take the place of the present Edith Furnace in the same city. It will be 100 by 20 ft., and will have an annual capacity of 150,000 tons. The Lorain Steel Company is building two furnaces at Lorain, to be 100 by 22 feet each, and to have jointly an annual capacity of 350,000 tons. When these 4 furnaces are completed and the Carnegie Furnace in Tennessee is in operation the estimated annual furnace capacity of the country will be increased in round numbers about 500,000 tons, making our total available annual capacity at the end of 1898 or soon after about 18,500,000 tons. Surely we do not need any more new furnaces.

Rolling Mills and Steel Works.—In the present edition we describe 504 completed rolling mills and steel works, of which 462 contain trains of rolls and 42 have no rolls. In the edition of 1896 we described 505 completed rolling mills and steel works. Since its appearance 32 new rolling mills and steel works have been built and 33 have been abandoned, showing a net decrease of 1. In April, 1898, there were 4 rolling mills in course of erection, against 5 rolling mills and steel plants building in January, 1896. Omitting all forged products the annual capacity in finished products of the rolling mills in April, 1898, was 17,929,850 gross tons, against 14,763,920 tons in January, 1896.

Bessemer Steel Works.—The total number of completed Bessemer steel works in April, 1898, including 2 Clapp-Griffiths plants and 1 Robert-Bessemer plant, was 45, with 1 works projected, against 50 completed works in January, 1896, and 1 works that was then partly built. The 45 Bessemer plants which are described in the present edition contain exactly 100 converters, against 109 converters in the 50 plants described in 1896. The annual converting capacity of the 45 plants of 1898 is 10,633,000 gross tons, against 9,602,450 tons in 1896.

Open Hearth Steel.—In the Directory for 1896 we described 88 completed open hearth steel plants and in the present directory we describe 99 completed plants. In 1896 there were 225 open hearth furnaces, 17 building, and 3 partly built; total, 245. In April last there were 281 furnaces, 2 building, and 3 partly built; total, 286. The annual capacity of the open hearth furnaces, built and building, in ingots and

direct castings, in April last, was 3,522,250 gross tons, against 2,430,450 tons in 1896.

Basic Steel.—In the present edition of the Directory we have been able to indicate the character of the product made at our open hearth steel works, whether acid or basic steel, or both. Of the 99 completed open hearth plants in April last 43 were prepared to make basic steel, and of 10 projected open hearth plants at that time a majority would probably make basic steel. The prominence which basic open hearth steel has attained in this country in very recent years is shown in the statistics of our open hearth steel production in 1897, when we made 1,075,689 tons of basic steel and 556,154 tons of acid steel. The Troy Steel Company is prepared to make basic Bessemer steel.

Open Hearth Steel Castings.—In 1894 there were 28 open hearth steel plants which were prepared to make direct castings, in 1896 there were 35 plants, and in 1898 there are 47 plants. In addition to these plants there are enumerated in the present edition of the Directory several crucible steel casting plants and a few plants which make Bessemer and other steel castings.

Crucible Steel Works.—In April last we had 45 completed crucible steel plants and 1 projected plant. The aggregate annual capacity of the existing crucible steel works is 95,000 gross tons, against 98,700 tons in 1896.

Iron and Steel Rail Mills.—All works which are prepared to manufacture standard, girder, light T, and other rails are classified separately from rolling mills and steel works in the present edition. The whole number is 51. One additional rail mill is being built at Kansas City, Kansas, to renew steel rails by the McKenna process. A mill to renew rails by this process was built at Joliet, Illinois, in 1897, and was in operation in that year.

Structural Mills.—The whole number of works which are now equipped to manufacture all kinds of structural material, including bridge rods, building rods, plates for bridge work, structural tubing, etc., is 66, and these are also classified separately from the rolling mills and steel works.

Cars, Car Axles, Car Wheels, and Locomotives.—Omitting railroad companies which manufacture, in part at least, their own cars, car axles, car wheels, and locomotives, we enumerate in the present edition 121 completed car-building works, 62 car-axle works, 110 car-wheel works, and 24 locomotive works.

Ships and Bridges.—In April, 1898, there were 44 iron and steel ship yards and 87 iron and steel bridge building works, all of which are described in the present edition. The list of bridge building works does not include contractors or railroad companies which build bridges, but only independent works with iron and steel bridge building plants.

Daly's Fast Freight Record.

Daly's patented apparatus and plan for supervising the movement of fast freight trains have lately been put in use by the Grand Trunk Railway for dairy, fruit and other high-class traffic. The scheme contemplates a temporary record based on telegraphic reports. There is a special way-bill (Forms 18 18 and E. 39) which accompanies each car of freight; index to switchmen and others as to the character of the lading; a report (No. 35, Form 410), for telegraphing the train and manifest numbers; a report (No. 37, Form 411), for wiring the arrival and departure of manifested cars at manifest stations; a report (No. 38, Form 412), used by conductors for reporting disabled cars set out of train short of destination; a board 24 ft. x 5 ft. divided into train districts (stations being shown longitudinally in the center); wooden blocks representing trains, and wooden pegs designating cars.

All important stations are made manifest stations, and are assigned a letter or combination of letters (usually the telegraph call) to designate them in telegraphing, and are also assigned a series of numbers to be placed on way-bills for cars manifested. Some stations are assigned 500 numbers, while others have but 99, the assignment being contingent on the amount of high-class business originated. When the highest number of each station's assignment is reached, the plan is to revert to number one.

While the principal points only are made manifest stations, all points on the line enjoy the benefits of the record, as the manifest stations are required to do the manifest work for the smaller points.

When a train of high-class freight is assembled, the agent fills out a separate manifest way-bill for each car in the train, inserting the station letter or cipher and manifest number. This way-bill may be a card which supersedes the ordinary tally-slip, or an envelope, in case the regular billing accompanies the freight. After way-bills are filled out, consecutively numbered, and the cipher letter affixed, the agent fills out a report (No. 35, Form 410), showing the make-up of the train, and wires the same to the car service agent at Montreal, in whose office is located the board and other paraphernalia. This report shows initial, number, contents and destination of all cars manifested; and in the margin at the left the manifest number of each car.

The use of manifest numbers to represent the cars in the train simplifies the operation of the scheme, and admits of a telegraphic check being obtained for about $\frac{1}{50}$ the expense which would be involved, were the movements of the cars to be reported by their initials and numbers. On receipt of this report small wooden pegs, bearing the station cipher, numbered to correspond with the manifest numbers reported, are placed in the train-block, the destination of the cars being indicated by placing under each peg the cipher letter of the station to which the car is destined.

The train-block is then hung on the board, its position being determined by the train district on which it is located and the direction of its movement. If east-bound, it is on upper part of board, and if west-bound on the lower portion.

As the train proceeds, each district terminal agent wires a report (No. 37, Form 411), showing time of arrival and departure, when the train-block is moved along on to the next district; the report designates the cars in the train by the lowest and the highest number, so that the record of 25 cars is obtained with no greater telegraphic expense than that of two cars.

If a car is set out between district terminals, on account of defects, the conductor wires a report (No. 38, Form 412), showing the point at which car is left, and nature of defects, when the peg representing the car in question is removed from the train-block and placed on the board opposite the station where it is set out, small holes being bored in the board for that purpose. The peg and the conductor's report remain fastened to the board until the car is taken up, when the peg is placed in the block representing the train taking it. Should the conductor neglect to report a disabled car set out, the fact is made known as soon as the train reaches the next district terminal, as the report of the train passing that point would indicate that it was incomplete. During the entire time a car is in transit its movement is carefully watched, and any unnecessary delay detected at the time of the occurrence.

As reports come in the information is recorded in a register; and when a train reaches destination the time consumed is computed, the time on each district and at each terminal point being taken into account, and if schedule time is not made the causes of the detention noted.

In case of a blockade on the road, the amount of business affected is at once apparent, the entire situation being observable at a glance. If detouring of traffic is desirable, the check on its movement is not relinquished, as a record is made of its delivery to connecting road, and upon its return the record on the Grand Trunk is re-established.

Railroad Signaling.

Some months ago Mr. F. A. Delano, Superintendent of Freight Terminals of the Chicago, Burlington & Quincy, at Chicago, gave a lecture on railroad signaling before the students of Purdue University. That lecture has been printed by the University in a pamphlet, and below we give a few extracts from it. Naturally, Mr. Delano treated the matter in an elementary and general way, considering the audience before him. He treated it, however, with great clearness and with excellent arrangement, and no doubt many signal engineers and railroad superintendents among the readers of the Railroad Gazette will be glad to get some of Mr. Delano's opinions on subjects concerning which he is so well qualified to speak.

To my mind a signal must, in the nature of things, be capable of two or more interpretations, in the most simple form of positive and negative one, and under this conception of a signal all stationary signs, which can only be susceptible of one interpretation, would be excluded from the term signal.

When fixed signals were first employed on railways, the important thought was to make the cautionary or danger indications prominent. The reverse or opposite indication of the signal was considered unimportant. It has only been in recent years, say twenty-five years in this country and somewhat longer in England, that the principle has become generally established, that it is quite as important to show a definite unmistakable indication for each interpretation of the signal. In other words, it is as important for the locomotive engineer to know that the line is all clear, as it is to know that the road is blocked, and the rule has been generally adopted that the absence of a clear signal must be interpreted as a danger signal; also, that the normal position of all signals is at danger, and any failure of parts allows the signal to go to danger.

In England, in the nature of things, no block system could grow up independent of the signals interlocked with switches, turn-outs, and cross-overs, but in America there has grown up a block system side by side with an interlocking system, and many of our railroad men to-day, and among them, able signal engineers, treat the two systems as separate and distinct, urging the use of a different form of signal for the interlocked signal than for the signal which is simply designed to space trains.

To the man up a tree, this distinction is objectionable and certain to lead to great confusion sooner or later. To him it seems that as necessity grows, all our switches and cross-overs on the main lines, as well as junctions and crossings, must be protected by signals completely interlocked with each other. At the same time, as the block system grows, one will soon overlap the other and become very confusing. To come nearer to earth, the man running the engine recognizes primarily only one of two meanings in signals, whether they be of one form or another: to him they must mean either that it is safe for him to go ahead, or that he must stop. He must know this as distinctively as possible, and in as few words. A circumstance that has added to the confusion is that while the semaphore signal has always been retained as the best signal for our interlocking plants, it has been found that some form of disk signal, incased in a weather-proof frame, could be more conveniently and economically operated in an automatic block system. This confusion bids fair to find an early solution in the general selection of the semaphore as the proper type of signal, whether it be interlocked with switches at stations and junctions, or whether it be simply a block signal, operated manually or automatically, for there is no denying that the semaphore is the preferable type of signal. Until this time shall have been reached, however, we shall have on some of our railroads three styles of fixed signals, differing slightly by day, and intended to convey slightly different shades of meaning to the engineer running the train, but at night not differing at all. These three styles of fixed signals are: First, the interlocked signal, which tells the engineer whether he must stop, or whether he may proceed, and, if he may proceed, by which route he is to be sent; second, the block signal, which tells the engineer he must stop or go ahead, because the road is blocked or clear ahead of him; and third, the train-order signal, which tells the engineer to stop if there is a train order for him, or to go ahead if there is none.

Great as has been the development in signaling in recent years, what is needed now is a rationalizing of many of the inconsistencies which now exist, and a simplifying of the indications of the signals, and of the signals themselves as much as possible. The importance of this statement can best be appreciated by those who frequently ride in a locomotive cab, not by sitting at the office desk. An engineer on an engine hauling a train at the rate of 60 miles an hour advances at the rate of 88 feet per second, and a signal must mean something decisive to him, immediately. One of the greatest arguments against the differentiation in the style of signals made in daylight signals is that no similar differentiation can be made in the night signals, and at best there is confusion in night signals arising from the multiplicity of signal lights at switch-targets, on trains, in neighboring buildings, and elsewhere, all of which add very much to the possibilities of confusion. The remedy for this is to diminish unnecessary signals as much as possible, and I am inclined to think that much more can be done in this direction than has ever yet been done.

The distant signal, or a signal of precisely the same description, is not infrequently known as a "cautionary signal." This arises from the use of signals in a permissive block system, that is, where more than one train is allowed in a block, and where the signal simply means to the engineer, "there is a train in the block; you must proceed with caution, expecting to meet it." In England, because the permissive block has practically gone out of use, the distant signal is always called a distant signal, and never a cautionary signal. It is painted the same color as the home signal, and displays the same colored light at night as the home signal, although the signal has a fish-tail end and so differs in respect to form from the home signal.

It does not require much thought to see that these two meanings of the distant signal are wholly different and distinct, not to say somewhat inconsistent. In its use as a distant signal it simply repeats the position of the home or the stop signal, forewarning the engineer of the position of the stop signal, which he may or may not be able to see, but the cautionary signal, as used in this country, means to the engineer that he must proceed with caution expecting to find a train in the block. In the automatic block signal system as it has been frequently introduced in this country, it is common to put a distant signal on the same mast as the home signal. The distant signal in this case is a distant signal, and not a cautionary signal, for it means not that there is a train in the block in advance, but that the next block signal at the beginning of the block beyond, is at danger or stop. In other words, it does not, if displayed horizontally, mean to proceed with caution expecting to find a train in the block, but it means that the block signal next in advance of this one is at danger or stop. It is obvious, therefore, that with a further introduction of the automatic block signal, and with the discarding of the permissive manual block system, except with a written order or printed card, the cautionary signal must go, and the distant signal alone remain.

The importance of placing signals so that they can

(*Continued on page 498.*)

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.

PUBLISHED EVERY FRIDAY,

At 32 Park Place, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc , to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

In our issue of Dec. 24, 1897, we published an illustrated description of the Chapsal electro-pneumatic brake, with an editorial article discussing the possible standing of such a brake in comparison with the Westinghouse quick-action brake. Our conclusions were not favorable to the probable use of an electro-pneumatic brake on the railroads of the United States. A reply to that editorial has been prepared by Mr. Georges Lesourd, an engineer of Paris, and the editorial article and Mr. Lesourd's reply are printed in a pamphlet which is distributed by the Miller, Du Brul & Peters Mfg. Co., of 507-511 East Pearl street, Cincinnati, O. A copy of this pamphlet has been sent to us with the following note: "You would oblige us very much, probably your readers also, to publish this article and so give it as wide a circulation as your editorial received. We trust you will see the fairness of this request." The Railroad Gazette makes its fair proportion of mistakes in statements of fact and in opinion, and it is a part of the definite and fixed policy of this journal to admit such mistakes and to publish corrections of them. In this case, however, we cannot consent to publish Mr. Lesourd's reply to our article. The text alone would fill about three pages of the Railroad Gazette, and the engravings which accompany it would fill about half a page, or more. We see no reason, after a careful examination of his argument, to change our opinion, and, furthermore, we are so convinced of the uselessness of attempting to introduce an electro-pneumatic brake on the railroads of the United States that we do not feel justified in giving the space to this matter which its full presentation would require. We are glad, however, to make this statement of the situation and thus enable the reader who may be interested in it to send and get a copy of the pamphlet. We have no doubt that the Miller, Du Brul & Peters Company, which controls Mr. Chapsal's United States patents, will furnish to the interested inquirer any information which he wants.

Some Studies in Acceleration.

The excellent paper on "Some Phases of the Rapid Transit Problem" before the Omaha meeting of the American Institute of Electrical Engineers, printed in this issue, brings out many points touching the question of acceleration which are often discussed in a general way, but seldom receive such thorough treatment. Attention may be called to some statements and to certain conditions as brought out by Mr. Armstrong. In Fig. 1 we have two acceleration curves, one a speed-time and the other a distance-time curve. These two are entirely different in their forms, but both express what would be nearly the observed conditions in the running of the train. It is well, then, to use due caution in drawing conclusions from the form of such curves, unless one is positive what ordinates are used in constructing them.

From the speed-time curve, it is evident that the author assumed a constant acceleration of the train, which would not be true in practice, as is shown by the form of the curves plotted from observed results of many tests. A straight line for such a curve denotes a constant rate of change of velocity, which condition is true for but a part of the time a train or motor car is getting up speed. An electric car fulfills the conditions necessary to give a straight line better than a locomotive drawing a number of cars. From observed data taken from a test at Schenectady with the Sprague motor cars last fall, the form of this curve was found to approach an equilateral hyperbola, although it would not be a vital error if it was assumed to be a parabola.* The assumption, however, of the author, although not strictly true, probably does not affect the value of the comparative results given in the paper.

The simple reason for his conclusion that a high rate of acceleration demands a greater expenditure of energy than a low rate lies in the fact that with a low rate a much higher maximum speed is demanded, as clearly brought out in Fig. 2. This conclusion, however, will not warrant the general conclusion that low rates of acceleration always save energy Among the conditions that Mr. Armstrong imposes on his train running 2,000 feet between stations are that the time to make the run is limited to 75 seconds and has a total tractive effort of 100 lbs. per ton, which are practically the limitations met with in offering a solution for rapid transit on elevated railroads.

Again, Fig. 2 affords a means of calculating the proper rate of acceleration, from which the best motor equipment, gearing and other parts for a given set of conditions can be determined. The current input required and the size and weight of the motors are among the limiting factors governing the rate of acceleration; other conditions enter in that make the problem not so simple as it at first appears, and it requires for its solution something more than reading off values from a curve. Mr. Armstrong has, however, given us a starting point, and his analysis is of general application.

The Comparative Performance of Air Brakes.

We receive occasionally from Mr. Thomas, of the Nashville, Chattanooga & St. Louis, a monthly record of air braked cars cut out and of the comparative defects or failures among air brakes of different make, and we have occasionally published these reports. But a serious drawback to their value is that he does not give us the names of the makers and so his reports lose their chief interest and value. They have, however, suggested to us an effort to get at some records.

At Buffalo inspection is made by the New York Central and the Delaware, Lackawanna & Western and also by the latter road at Hoboken, and at both those points the inspection and records are such that one can get there precisely the sort of information that we are seeking. An examination of the figures collected at those two points for two months shows that in that time 25,709 cars fitted with Westinghouse brakes were inspected. The total of other brakes passing through the yards in the same period was 487. Among these cars, 382 with Westinghouse brakes were cut out as defective, but 29 were found to be in good condition and had been cut out without cause. There were, therefore, 353 brakes out of order, or 1.4 per cent. of the whole number. Taking all other brakes, 66 were cut out, seven of which were in good order, leaving 59 defective, or a little over 12 per cent.

This, however, is only part of the story. These figures include all defects, but, since the brakes of different makers are chiefly distinguished by the construction of the triple valve, and since the peculiar construction of the triple valve defines the characteristic operation of the brake apparatus, the really important comparison is between triple valve defects. It was found that of the Westinghouse brakes, 43 were inoperative on account of triple valve defects, or about 12 per cent. of the total number of defective brakes of that make, or about $\frac{1}{16}$ of one per cent. of the total of Westinghouse brakes passing through the yards. Of other kinds of brakes, 36 were found inoperative because of triple valve defects, or a little over 60 per cent. of all their defective brakes, and 7.4 per cent. of the cars so equipped which passed through the yards. Considering all brake defects and basing the calculation on the relative number of brakes passing through the yards, there were 8.6 times as many failures in others as there were in the Westinghouse brakes. The real test, however, of comparative efficiency is in the triple valve, as we said above; and this point cannot be too strongly emphasized. Here is the place where the difference of design and principle exists and where the perfection of workmanship counts most; in other words this is where the air brake becomes characteristic and individual. But in the triple valve the defects in the class of "others" were 44 times as numerous as in the Westinghouse valve.

We shall not attempt to draw any conclusions from these figures. It is possible that they are too few to justify conclusions; it is possible that the record of a greater number of cars extending over a greater time would show somewhat different proportions, which might be more favorable or less favorable to the Westinghouse brake. Concerning all this we shall express no opinion, but present these extremely interesting figures for what they are worth. The collection and publication of records of this sort is the beginning of the correction of a set of bad conditions concerning which Mr. Rhodes spoke with much gravity—not to say asperity—at the Saratoga Convention of the Master Car Builders' Association. Every reputable maker of air brakes ought to wish to have this matter followed up by the publication of the records of a far greater number of inspections; certainly the interest of the railroad companies calls for this kind of investigation, and for these reasons we are glad to be able to give the figures which are presented here.

*For full discussion of this, see Railroad Gazette, Dec. 24, 1897, p. 911.

Per Diem Car Service.

There was an announcement last week in our report of the Car Accountants' Convention (page 474), which may prove to be an important event in the economics of railroad operation. We refer to the agreement of five important railroads controlling, between them, about 100,000 freight cars, to settle for the use of exchanged cars, as between themselves, on the basis of time instead of mileage. Mr. Daly's scheme (which was reviewed in our issue of June 17, page 437) is described by its originator as a combination of mileage and per diem, but we think it may fairly be called a simple per diem plan, somewhat sugar-coated, for the greater comfort of managers who are not ready to adopt a just rule.

The Illinois Central simply proposes to its neighbors to borrow and lend cars by the day, and to base the rate per day, so far as it appears in the tangible form of money transferred, on the same illogical plan that is already in vogue. If you have used I. C. cars in legitimate service, making good mileage, you pay a good price, but no more than the car is worth to you; as, for instance, 100 miles a day, 60 cents a day. If you have made poor use of the car, say ten miles a day, you pay only what you would pay at the mileage rate, six cents a day. Thus the rate is varied from month to month, in the hope that the most captious will be ashamed to complain if the balance is unfavorable. The possibility—the likelihood, indeed—that the rate will be less than the actual cost of the car to the owner, still remains; but there is the important advantage, the great advantage which always goes with the per diem principle, whatever guise it is made to take, that every borrower can make money by hurrying borrowed cars home; that is, by keeping them in their legitimate use as moving vehicles, and preventing their use in the illegitimate function of stationary storehouses. This advantage is so great that any modification, logical or illogical, which promises to secure it, is to be looked upon with favor.

The substantial equity of the per diem plan is based on the fact that the wear and tear of a car depends so much more on lapse of time (exposure to the elements) and use in switching, than on miles traveled, that it is not worth while to try to estimate the mileage element; and the rank injustice of the mileage plan is due to the equally unanswerable consideration that only one of the two parties interested can keep a satisfactory record of the service of the car. Under the mileage plan every borrower is constantly defrauding one road or another, when the accounts are honestly and correctly kept; and the chance for further fraud by dishonesty or carelessness makes the plan obnoxious to the simplest principle of business fairness.

It can hardly be necessary to argue these points at this late day. The principle of per diem has little need of defence; the rate per day is a sufficiently knotty problem after the principle has been accepted. The Illinois Central adopts a variable

rate—any rate—to secure a trial of the plan. In 1892 a rate of one cent a day was proposed, to be collected in addition to the mileage rate, the idea being to introduce, in the most unobjectionable way possible, an incentive to the user to promptly return borrowed cars. But it did not take. Combinations of the per diem and mileage bases have been proposed in various ways, both in the American Railway Association and by individual students of the problem, and in 1887 and 1888 a number of prominent roads tried the mixed plan for several months, but the burden of adjusting inequalities and disputes was too great for the courage of the managing officers, the experiment was abandoned, and the discussions of the past ten years have resulted in little but to confirm the conviction among probably a large majority of those who have carefully examined the matter, that straight per diem is the best plan. The interest on the cost of a car, added to the deterioration which is due to causes wholly independent of the distance it may travel, is so very much more important than wear and tear due to movement over the road that the argument is practically conclusive.

In the great diversity of views prevailing as to the best method of making a change from a wrong to a right method, it looks as though a good deal of negotiation would still be needed to get the reform well started. As before stated, the Illinois Central now adopts the method which seems likely to meet the least objection from "the average road." There seems to be little use in trying to generalize concerning considerations of expediency, for "expediency" is based on such different principles by different roads. Never was the fallacy of judging by average results better illustrated than by the experience of different roads with freight car earnings. One road will make money by per diem at any price, and goes for it enthusiastically; another will make less profit than under the mileage plan, and would not change for the deepest principle in the world. The idea of profit to the lender has been urged as an important element in making the per diem rate. He should charge enough to lead the borrower not only to hurry cars home, but to build cars for himself. This fails because borrowers frequently find cars worth ten or fifty times as much as the highest rate ever thought of. No rate has any terrors for some roads when they have heavy offerings of highly profitable freight and no cars to put it in.

Nothing coming of all the past attempts to be "practical" and steer clear of mere theory, why not adopt the simple theory, which also should appeal to every one who desires to be truly practical, of charging just what a car costs? The elements of the daily cost of a car are well set forth in a paper by Mr. Yardley, which was printed in the Railroad Gazette in 1895, page 833. It will be recalled that he found 25 cents to be very close to the true figure. Charging at cost eliminates all questions of wrong motive, and is more rational than the mileage plan, even if the latter worked as well as it was expected to when the fathers adopted it. It still leaves some inequalities, but these are of a nature that no general rule can correct. When cars are scarce the borrower will get an advantage, and when they are over-plenty borrowers who own but a few cars will want a reduction in the rate. But a fixed rate is a great desideratum, and it is to be hoped that the experience of the Illinois Central and its followers will rapidly develop a way of reaching an agreement on some plan of introducing one.

Abusing railroad employees by requiring them to submit to tests for color-blindness must be one of the worst offenses against the moral law, if we may judge by the persistency with which the subject is reopened every few months. And, strange to say, the last objector to scientific tests is a railroad surgeon, a speaker at a recent convention of railroad men in the West. We cannot believe that a surgeon of character and knowledge would deliberately deny the value of tests for insuring good eyesight in trainmen; and, indeed, in the present case, there seems to be some misapprehension, for the doctor's argument is based partly on the non-necessity of having a fireman submit to an alleged requirement to name a number of different shades of the same color of worsted; but the result of any criticism of the worsted test is to give aid and comfort to those enginemen who would rather run into an open draw with a whole train than admit that their eyes ought to be examined. Men who know the philosophy of scientific tests should be exceedingly cautious in criticising them, for, it appears, there are still railroads where the men have not been thoroughly tested, and where, consequently, there are still men who believe that the best way to keep their jobs is to object to all tests, with a view to concealing the condition of their eyes. However great the need of more elaborate physical tests of railroad men's lungs, or legs, or noses, the failure to establish these affords no ground for discountenancing the eye tests. Asking a man to select nine shades of green from among a lot of grays and browns has never done any harm. We have never heard that any employee was unjustly discharged even if he could pick out only six shades, or only three, and could not name any of them. In short, the most elaborate tests, those which have caused the most alarmed remonstrances, have never done anything more than show the precise condition of a man's eyes. They have never made the condition appear worse than it was. We judge that the use of green signal lights for indicating all-clear at night is likely to slowly increase in this country, and perhaps finally supersede white entirely; and, as, where such lights are used, the possible danger to be expected from color-blindness in an engineman is more pronounced than when an uncolored glass is used for one of the signals, the universal use of rigid color-blind tests is increasingly necessary.

Suits for damages for alleged blacklisting continue to be reported somewhat frequently. At Norwalk, O., in a suit against the New York, Chicago & St. Louis, a jury has returned a verdict for $5,000. At Memphis, Tenn., a blacksmith has sued the Kansas City, Memphis & Birmingham for a large sum, claiming that he was persecuted by the road, though the real reason for his leaving its service was shutting down the shops on account of the Debs strike. Complainant appears to have been as inoffensive as his anvil. Both these suits are based on things done in 1894. We have no knowledge of their merits and it would be nothing surprising to hear that they had failed utterly in the higher courts; but as straws, they show which way the wind blows. If impecunious lawyers are to take up every case of this kind which promises a fighting chance of getting a small fee, railroad officers may find it expedient to guard against such attacks merely to avoid petty annoyance. If the manager of the A. & B. answers simple questions from the C. & D. road concerning John Doe's past record, Doe may be able to find plausible ground for trumping up a charge of blacklisting, and make a good deal of bother, if nothing more. One prominent road has adopted the rule of not answering such inquiries. The inquiring superintendent is told that if Doe himself asks for a transcript of his record, it will be cheerfully given to him. That certainly imposes no hardship. It is true that it may be good for the railroad service generally to warn superintendents against unworthy applicants, but men are not now so scarce as to necessitate hiring strangers for permanent places, and the road which refuses to give records to third parties can hardly be called reprehensibly selfish.

The Commissioner of Internal Revenue has decided that where a railroad charges a passenger for excess baggage a bill of lading must be issued and a one-cent revenue stamp affixed, the same as in the case of goods sent by express. The principal express companies have decided that they will not pay the internal revenue tax on bills of lading, and thus far shippers have been required to furnish and pay for their own stamps. The Merchants' Association of New York City has protested against this action and will begin a suit in the United States courts to test the right of the express companies to throw this burden on the shipper. The express companies say that the stamp tax would use up about 40 per cent. of their net receipts. If this percentage holds with all the companies it would indicate that the average net earnings on express packages amount to only 2½ cents a package. The Western Union Telegraph Company requires senders to stamp all telegrams and has issued regulations requiring the stamp to appear on all messages, free as well as paid or collect. The Commissioner of Internal Revenue, in replying to a New York merchant concerning certain clauses in the war revenue law, says that where a shipping receipt is issued for freight and afterwards is exchanged for a bill of lading, the tax is required to be paid on both documents. On export bills of lading the stamp tax of 10 cents is declared to be requisite only on the original, not on duplicates. The ten-cent tax applies, of course, to bills of lading for goods going to Canada or Mexico, and the newspapers say that the railroads will refuse to pay the tax on such blils.

The Louisville & Nashville, which advanced the wages of employees on July 1, as announced in our last issue, not only hopes to make an additional advance on January 1, but, according to the official circular, since received, definitely promises to do so. This action of the Louisville & Nashville is followed by similar increase of pay on the Cincinnati, New Orleans & Texas Pacific, though the amount and extent of the changes on the latter road are not published. This road is in the hands of a receiver, and according to the law just passed by Congress, the change ought to have been made only after a hearing by the Court; at least that would be the requirement if it were a reduction instead of an advance. We have not read of any hearing, however; and it may be presumed that the labor leaders will not demand one.

Mr. Tilly Haynes, a veteran hotel keeper of Boston and New York, says that the hotel business has been revolutionized in the last 15 years, there being much less travel than formerly. The practice among retail merchants of buying goods directly from manufacturers has greatly reduced the number of jobbing houses in Boston. The railroads are wrong, he says, in attributing all their passenger traffic losses to the electric street railroads. Long distance travel has been diminished by the use of the long distance telephone. Certain business men in Boston recently saved a week's time and $300 in railroad fares by spending $11.50 on telephone messages. This, says Mr. Haynes, is hurting the hotels and the railroads more than they have yet admitted.

NEW PUBLICATIONS.

Introductory Course in Mechanical Drawing.—By J. C. Tracy, C. E., Instructor in the Sheffield Scientific School. With chapter on perspective by E. H. Lockwood, M. E. New York and London: Harper & Bros.; 7½ x 10½ in., 115 pages with eight full-size plates. Price $1.80; 20 cents additional if ordered by mail.

In order that a new book discussing the elements of mechanical drawing be favorably received among beginners, it should be simple, direct and suggestive in its treatment, besides being attractive in its make-up. Judged by these requirements, the book before us is not found wanting. Like most, if not all, of the applied sciences it requires much hard work and some native ability to master the principles of mechanical drawing. In Professor Tracy's book, the student opens to a stern realization of work ahead. In the first 18 pages some 200 practical problems are given. Each set of problems is accompanied with notes referring the student to other parts of the book, but he is largely dependent on his own ingenuity and perseverance in solving the problems.

In the first three chapters are given useful hints for the selection of the outfit, the use of drawing instruments and some general directions to help the student over some of the difficult points which are sure to be met.

Isometric and cabinet perspective are well treated, but too briefly. In the 20 pages on Authographic Projection the author has given a large amount of matter. In this chapter the author's simple and direct style of presentation makes what is usually regarded as an obscure subject very plain to the beginner.

In chapter 7 Mr. Lockwood treats the subject of perspective in a somewhat different manner than most authors. Whether his departure from established customs will make the subject any clearer to the student we cannot say, but on the whole it may possess certain advantages. He uses the vertical plane as the picture plane, places the object in a third angle and the point of sight in the fourth.

Excellent illustrations are used freely throughout. Great care has evidently been taken to eliminate every unnecessary description, that some authors would drag in only to the confusion of the learner. It may be questioned, however, if too much has not been left out, especially if the book is designed for any class of engineering students. The young engineer requires considerable practice in sketching and machine design, and these are entirely omitted in the work before us. In general it may be said that the book treats of principles, leaving the more practical applications to be investigated by the student from the explanations given.

Gas, Gasoline and Oil Vapor Engines. By Gardner D. Hiscox, M. E. Second edition, revised and enlarged; 365 pages and 270 illustrations. New York: Norman W. Henley & Co. Price $2.50.

In our issue of May 28, 1897, we reviewed the first edition of this book, calling attention to both its merits and defects. In the preface to this edition the author states that the first edition has been "corrected, revised and contains much new matter, including data relating to the adaptation of these motors to vehicles and launches, a branch of the subject which is of great and growing interest." The book now comes to us much improved by the revision.

The patents of 1897 under their present headings have been added and a list of the names and addresses of builders of explosive motors in the United States has also been appended. We appreciate the author's difficulty in obtaining this last mentioned list. The additions to the list of engines illustrated increases the value of the book, but it may be questioned by some if too much space is not given to engines that are built only on a very limited scale.

Street Railroad Guide for Eastern Massachusetts.—Mr. Robert H. Derrah, 115 Devonshire street, Boston, issued a new edition of his guide for the trolley roads of Eastern Massachusetts and Rhode Island. The folding map which accompanies the guide shows the extent and connectedness of the electric railroads of this locality. One can ride on the electric roads from Boston to Nashua, N. H., via Lowell, and from Lowell along the Merrimack to Newburyport and Salis-

bury Beach; from Boston to Worcester, and from Boston to Taunton, there traveling off to either Fall River and Newport or to Providence. Of course these long journeys involve changes of cars.

The number of miles operated by the street railroads of Massachusetts and Rhode Island included in the guide is 1,368 out of a total mileage in the states of 1,738. The work is descriptive and has about 90 half-tones, and has indexes to roads and routes giving distances, time and fares. Price 15 cents.

The Technic.—The Engineering Society of the University of Michigan has issued its annual proceedings, including, as in previous numbers, the papers presented at the meetings of the Society, together with other articles of interest to engineers. Among the list of contributors are Professors H. S. Carhart, R. C. Carpenter and J. B. Davis. Among the papers here printed are the following: "Φ" and Its Destruction," by Mr. W. D. Ball; "Notes on Railroad Bridge Construction," by Mr. Henry Goldmark; "Efficiency of Tests on the Englewood & Chicago Electric Storage Battery Road," by Mr. G. A. Damon, reported in our issue of Feb. 4 last, and "Electric Conduit Construction," by Mr. G. B. Springer. The volume can be secured for 50 cents from the Secretary, Engineering Society U. of M., Ann Arbor, Mich.

TRADE CATALOGUES.

Pneumatic Tools.—It is 20 or more years since a boiler-maker in the Baldwin Locomotive Works designed a calking tool with a rounded instead of an angular end, and by this simple change made an important improvement in the art of calking boiler seams. Mr. Connery developed the art to its limit, where hand power only is used. The same tool, with a shank to fit a "New Boyer" pneumatic hammer, now does the same work at one-fourth the cost of hand labor. This saving by pneumatic tools is not new, but it is only within recent years that these tools have been perfected so as to be free from severe vibration and heavy shock, which was so injurious to the workman as to prevent their extended use.

The new catalogue of the Chicago Pneumatic Tool Co. gives surprising statements of the variety of air-power tools so far perfected, as well as of the extent to which they are now in use. They make breast drills; piston air drills for boiler and bridge work and ship building; riveters, casting cleaners, and a sand-papering machine which finishes, ready for painting, a car sided up with lumber as it comes from the mill, doing the work of six carpenters; and when this is done the pneumatic painter comes in and saves a lot more time. For boiler flues there are the pneumatic roller, the expander and cutter, the welder and the reducer, and here are opportunities to save money in material as well as in labor.

But the pride of the establishment is the improved hammer with a hospitable chuck for any tool that works with a reciprocating motion. It will bead 250 locomotive flues in 100 minutes. It will chip iron or steel castings or calk boiler seams or cut off stay-bolts or drive rivets, and all with economy and without discomfort to the operator. The astonishing but believable statement is made that these tools are already in use on 245 railroads in America and on every prominent railroad in Europe, as well as in 2,000 boiler shops and ship yards.

This and more information is given in the thoroughly creditable catalogue, which has 32 engravings from wash drawings of considerable artistic merit, together with many testimonial letters from railroad companies and manufacturers, who save money by using these tools. It is well bound in leather and is worth keeping.

Window Fixtures.—O. M. Edwards of Syracuse, N. Y., maker of the Edwards' window fixtures for railroad car windows, has issued a new catalogue, 6 x 9 in., giving illustrations and full description of his patent fixture. A large number of these are now in use on the Pennsylvania Railroad.

Phosphor Bronze.—The Phosphor Bronze Smelting Co., Limited, 2200 Washington Ave., Philadelphia, Pa., sends us price list No. 13, being of date June 1, 1898.

New Equipment for the Kiushiu Railroad of Japan.

Our correspondent in Japan writes: The Kiushiu district, where about 70 per cent. of the coal of Japan is produced, is extremely prosperous. A sudden and heavy increase in the demand for coal has caused a rise of 100 per cent. in price and a large increase in production. The miners are getting good wages and spending money freely. A peasant who has been working hard for his bread now dresses himself in silk gowns and travels in first-class cars. The first and second-class passenger traffic on the Kiushiu Railroad, which runs through the coal district, has increased nearly 200 per cent.

The Kiushiu Railroad has about 1,000 freight cars suitable for carrying coal, which provides for transportation of between 6,000 and 8,000 tons of coal a day. According to statements of miners, this is only about 50 per cent. of the capacity of the mines now being worked.

The increase in both passenger and freight traffic has forced the company to order considerable new equipment. Materials for 50 passenger and baggage and 900 freight cars were ordered from England and Germany, by competitive bidding, through commission houses in Japan. The materials ordered for this equipment were:

1,840 pairs of wheels and axles for freight cars.
210 pairs " " " " " passenger cars.
4,000 springs for freight cars.
4,000 buffers, with springs.
2,000 volute springs for buffers.
400 underframes for freight cars.
50 " " passenger cars.
100 passenger car trucks, without wheels and axles.
20 elliptical springs for passenger car trucks.
10 spiral springs for passenger car trucks.
420 sets of steel channels for freight car underframes.

The specifications call for the following:

Wheels: Centers of wrought iron, equal to double Best Staffordshire; double spokes welded together at rim; outside diam. at rim, 2 ft. 5⅛ in.

Tires: Siemens-Martin steel, tensile strength not less than 38 tons per sq. in., and elongation not less than 20 per cent. in 2 in.; to be shrunk on centers at a temperature not exceeding that of a dull red heat; to be subject to the usual test of dropping a weight of 20 cwt. from a height of at least 15 ft. without breaking or showing any sign of cracking; diam. on tread, 2 ft. 10⅛ in.; width, 5 in.; thickness on tread, 2½ in.

Axles: Siemens-Martin steel, tensile strength not less than 35 tons per sq. in., and elongation not less than 25 per cent. in 3 in.; wheels to be forced on axles by hydraulic pressure of at least 60 tons and not keyed; tires to be shrunk on wheel centers with a shrinkage of one-thirty-second of an inch per foot diam., and fastened with Mansell's rings.

Freight Car Springs: To be of spring steel, converted from Swedish iron. Each spring must have one-half inch deflection under load of one ton.

Buffers: Buffer rods and buffer heads to be of wrought iron, equal in quality to double Best Staffordshire; buffer springs of volute springs of best spring steel, 4¼ x ⅜ in.

Freight Car Underframes: Sole bars and buffer beams of 9 x 2¾ x ⅜ in. channels, and intermediate members of 7⅛ x 2¾ x ⅜ in. channels; channels to be riveted together with steel plate pieces ½ in. thick or joining pieces specially made, and ¾ in. rivets placed not more than 2 in. apart. Distance between center lines of sole bars, 5 ft.; length over buffer beams, 17 ft. 8 in.; length of buffer beams, 7 ft. 6½ in.

Passenger Car Underframes: Sole bars and main cross-beams of 9 x 2¾ x ¾ in. channels; intermediate members of 7⅛ x 2¾ x ¾ in. channels. Outside width over sole bars, 6 ft. 6 in.; length over main cross-beams, 47 ft. 6 in.; sole bars to be in one length, of 47 ft. 5¼ in. each, or in three lengths, two to be 17 ft. 8⅝ in. long and the center one 12 ft. long, jointed at the compression posts.

Passenger Car Trucks: Frames of steel channels and angles, equal to the quality specified for sole bars, to carry maximum load of about 10 tons; main bearing springs to be elliptical, three at each side, of best rolled spring steel, 3½ in. wide and ⅜ in. thick. Axle boxes, cast-iron and brasses of alloys, lined with anti-friction metal.

Steel Channels for Freight Car Underframes: To be capable of standing tensile test in any direction of not less than 27 tons per sq. in., and of elongation of not less than 20 per cent. on a length of 6 in. (measuring on the original area of section before construction), and 30 per cent. contraction at the point of fracture.

The performances of engines built by the Schenectady Locomotive Works induced the road to buy more from the same firm. An order for 12 consolidation engines was given in May, a brief description of which appeared in the Railroad Gazette of May 20. The first engines built by the Schenectady Locomotive Works for the road, 12 eight-wheelers, were finished in the fall of 1897, and the order was practically duplicated in March of this year, making 36 engines in all.

Estimates of the requirements of the road for the next fiscal year are being made up and will provide for a large number of additional coal cars and considerable mining machinery.

Railroad Signaling.

(*Continued from page 495.*)

readily be seen at considerable distances has not been as fully considered in this country as in England. Here, the usual rule is to make semaphore masts of a standard height, so that the signals shall be displayed at a standard height above the rails, usually about 20 ft. for a single signal or for the lowest one of two, and 4 ft. higher for the next signal above it, in case there are two signals on the mast. This seems a convenient and good rule, but there are times when exceptions should be made to it. This is illustrated by the English practice of "sighting" signals. There, before the signals are set, the signal engineer is required to determine the position and height of the signal with a view of making it readily visible at considerable distances, and obtaining a good background for the signal. Sometimes artificial backgrounds are built behind signals, and not infrequently signals are placed on masts as high as 40 to 50 ft., with a repeating arm close to the ground, so as to enable the engineer to see the arm high in the air, or near the ground, at all times.

The development of the automatic block signal, which, as already indicated, represents the highest state of the art in block signaling, has been the result of an immense amount of ingenuity. Various plans, more or less successful, have been devised by which a signal at the entrance of a block is displayed at danger by the entrance of a train into the block, and cleared again by the departure of the train at the other end of the block. The consensus of opinion seems to be that none of these devices are satisfactory, except those which make use of an electric current passing through the rails of the track in what is called the "track circuit," the reason for this being that no treadle or track instrument can properly provide for the emergency of a "break-in-two," whereas with a track circuit, a single pair of wheels left in the block will hold the signal at danger as effectually as if the entire train was there. The track circuit has the further advantage of showing a danger signal if the line is blocked by a broken rail, a wash out, or a burned bridge, which is in itself a very important feature.

TECHNICAL.

Manufacturing and Business.

The Western Rubber Belting Co., of Chicago, made an assignment June 27 to the Chicago Title & Trust Co., and Judge Carter ordered the assignee to continue the business of the firm. The assets are estimated at $140,000, and liabilities at about $128,000. The assignment was caused by the failure of the Boston Woven Hose & Rubber Co., for which the Western Rubber Belting Co. acted as Western agents, but it is believed the trouble of the Chicago company will be only temporary.

The Case Mfg. Co. of Columbus, O., has recently made sales as follows: The Reeves Iron Co., Canal Dover, O., one 15-ton electric 3-motor crane. The National Electric Co., Brooklyn, N. Y., 92 ft. 25-ton crane. The Dayton Globe Iron Works, Dayton, O., 8-ton hand power crane. The Bullock Electric Mfg. Co., Cincinnati, O., 20-ton electric crane. The Dresden Iron & Steel Co., Dresden, O., 15-ton crane. The company has lately put in operation one 15-ton crane for the Johnstown Tin Plate Co., Johnstown, Pa.; one 15-ton electric traveling crane for the Old Meadow Rolling Mill Co., Scottdale, Pa.; one 10-ton electric traveling crane for the Lewis Foundry & Machine Co., Kansas City, Kan.; two 30-ton electric traveling cranes shipped to Sydney, New South Wales; two 10-ton and one 15-ton electric 3-motor traveling cranes for the Laughlin Iron Works, Wheeling, W. Va.

The Pennsylvania Car Wheel Co., Pittsburgh, Pa., intends to double the capacity of its works at Allegheny. This company has received a contract for 8,000 wheels to be used under the 100,000 lbs. capacity cars now building for the Pennsylvania Railroad. They have also received some other large contracts.

Chas. F. Orthwein & Sons, St. Louis, Mo., will build at Fort Worth, Tex., a first-class rapid handling grain elevator of about 600,000 bushels capacity. The plans will be drawn by John F. Metcalf & Co., of Chicago. The contract has not yet been let.

Iron and Steel.

At the annual meeting of the stockholders of the Bethlehem Iron Co. held June 28, the following Board of Directors was elected: R. H. Sayre, Sr., Joseph Wharton, E. P. Wilbur, R. P. Lindeman, Beauveau Borie, J. B. Lippincott and R. W. Davenport. The Directors elected the following officers: President, R. P. Lindeman; First Vice-President, R. H. Sayre, Sr.; Second Vice-President, R. W. Davenport; Treasurer, C. O. Brunner; Secretary, Edward S. Schropp.

The Sargent Company, Chicago, reports that its steel casting department is now being worked to its full capacity. Large orders have been received for steel castings for 10-in. gun carriages.

New Stations and Shops.

It has been reported that the Cincinnati, Hamilton & Dayton is preparing plans for a new freight house at Indianapolis. We are officially informed that there has been nothing definite done.

The Sterlingworth Railway Supply Co. has given a contract for a brick extension to its works at Easton, Pa. The extension will cover an area of 145x108 ft. Contracts for a portion, but not all of the machinery have been let.

The rearranging of the yard at Conway, Pa., has necessitated the removal and reconstruction of the Pennsylvania Railroad's engine house. The company is building a roundhouse to house 15 engines and is doing the work with its own force.

The Peoria & Eastern, a division of the Cleveland, Cincinnati, Chicago & St. Louis, has started work at Moorfield on an 18-stall segment of a 40-stall roundhouse, and is putting in a new water station. For the present the company will re-arrange its office and storeroom and machine shop and will move all the tools from Moorfield to Urbana and will consolidate the shop work at Urbana. The roundhouse at Moorfield is being laid out with reference to the possible building in time to come of large locomotive and car shops. The roundhouse will be 75 ft. deep, concrete foundation to top of ground and rubble masonry to water table. The water table will be planer dressed Indiana Oolitic stone. The building will have 13 in. brick walls surmounted by an 8 in. stone coping with four-ply roofing felt laid over tongue and grooved pine sheathing and all covered with tar and gravel; copper gutters; doors to be hung on cast iron columns; Roe adjustable cast iron ventilator.

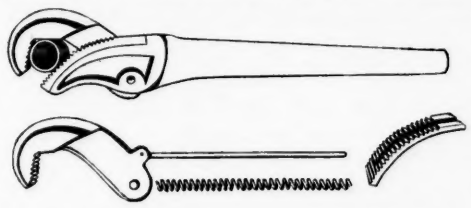
Air Brake Litigation.

Last week the United States Circuit Court of Appeals for the Second District handed down its decision in the case of the Westinghouse Air Brake Co. against the Great Northern Railway Co. This suit was brought to compel the Great Northern to remove the infringing New York brakes from its cars, and on

April 1 the United States Circuit Court issued a decree granting an injunction and ordering the removal of the brakes, some 3,200 in number, all of which has been noted in these columns. The defendants appealed from the decision of the Circuit Court, and the Court of Appeals now renders its decision affirming the decree of the lower court.

Reed Standard Pipe Wrench.

The accompanying illustration shows the parts of the Reed pipe wrenches, made by the Reed Mfg. Co. of Erie, Pa. These are faced with tool steel and the jaws are of crucible steel, drop forged. All parts of



all the wrenches made by this company are interchangeable. The prices vary from $2 each for wrenches designed for ⅛-in. wire, to ¾-in. pipe, to $9 for those intended for pipes from one to three in. in diameter. The company is represented by F. C. McLewee, St. Paul Building, New York City.

Tests of Electric Heaters.

The annual issue of Technograph, published by the engineering societies of the University of Illinois, contains the following table, in which are given the results of tests made by Messrs. Adams and Campbell, of the university, on five electric car heaters.

Items.	Designation of Heaters.* A	B	C	D	E
No. of Heaters per Car.	4	4	4	6	6
Number in Series.	2	2	2	3	3
Conductor Material.	Krupp Metal.	Iron.	German Silver.	Iron.	German Silver.
Size, B. & S. gage No.	20.	18.	22.	20.	19.
Diameter, in.	.032	.0403	.0253	.032	.0359
Cross section in c. m.	1,021.	1,624.	640.1	1,024.	1,289.
Length of wire per heater, in ft.	372.	181.5	128.	339.	163.
Length of wire per car, in ft.	744	726.	512.	2,034.	978.
Resistance per 1,000 ft. at 22½ C.	28.2	46.83	196.	91.	232.
Resistance per car (as compared) at 22½ C.	105.	34.	100.4	92 7	113.7
Diameter of resistance coils, in in	⅜	⅜	1⅜	⅜	Not coiled.
Pitch of resistance coils in turns per in.		3.	6.	9.	
Radiating surface of wire in sq. in	6.2	7.6	3.44	16.9	9.2
Radiating surface of cases in sq. ft.	32.4	9.	8.66	12 5	13.
Area of upper air ducts, in sq. in.		84.	197.4	164.	300.
Area of lower air ducts, in sq. in.		84.	69.	164.	187.5
Volume of cases, in cu. ft.		2.52	1.33	3.15	2.15
Watts radiated, per hour per sq. ft of wire surface.	546.	468.	587.	173.6	350.
Weight of set, in lbs	238.	168.	90.	231.	129.
Watts per hour, per lb.	14.2	21.1	22.4	12.7	25.
Max. tem. of conductor, in degs. C.	69.	147.	130.	137.	136.
Av. Watts absorbed.	1,776. (One heater)	1,826. (4 in series)	1,037. (2 in series)	1,637. (3 in series)	1,607. (3 in series)

*Heater A was made by the Whittingham Co.
Heater B was made by the Interior Conduit & Insulation Co.
Heater C was made by the Ohio Brass Co.
Heater D was made by the Consolidated Car Heating Co.
Heater E was made by the American Electric Co.

Subjects for the M. C. B. Convention of 1899.

The committee appointed to report subjects for the 1899 convention submitted the following list of subjects:

First—Standard specifications for lumber in freight car construction.
Second—Best design of freight car door fasteners.
Third—Standard application of air brake appliances with a view to reducing the number of couplings in pipes.
Fourth—Best method of applying running boards and ladders to freight cars.
Fifth—Committee to report on the advisability of allowing a differential or fixing prices for repairs done on work west of the 105th meridian.
Sixth—Perfection of top-hinged oil-box lids, so as to more completely exclude dust from journal boxes.
Seventh—To recommend standard journal boxes 3¾ in. by 7 in., and 4¼ in. by 8 in., adapted to use with the pedestal type of freight car truck.
Eighth—To define length and spread of guard arm, and to consider the devising of a safety limit gage for determining when M. C. B. couplers and knuckles are worn beyond a limit of safety.
Ninth—To revise the recommended practice of loading poles, logs, bark and other structural material on cars.
Tenth—To report specifications for M. C. B. Couplers.

Blast Furnace Gas for Motive Power.

The following is a translation of a few paragraphs (from the Génie Civil of May 21), from a paper by A. Pourcel on the "Utilization of Blast Furnace Gas for Motive Power." These are most important figures and probably we have nothing in this country that compare with them. The reader is cautioned, however, from drawing any conclusions until more is known about conditions under which the engines are run.

The problem of the utilization of coke-blast-furnace gas for power, difficult enough because of poverty of the gas, is further complicated by the presence of the plentiful supply of dust always accompanying it. At Seraing this difficulty has already been surmounted sufficiently for the supply of an 8-H. P. gas engine which has been running since December, 1895. The results of this practical application upon a small scale have been published by Mr. H. Hubert in Annales des Mines de Belgique. To-day Mr. Greiner announces the complete success obtained in the application of the gas for this same furnace to a 200-H. P. Otto-cycle engine. Within only a week, he says, the Hoerde works have put in operation a 600-H. P. engine operating upon the two-phase cycle, with results which are understood to be satisfactory.

Before this, in Scotland, the problem has been solved by Mr. B. H. Thwaite, with an engine of his own invention,* suited to operation upon poor gas. Since March, 1896, a Thwaite engine of 14 to 15 H. P. has been run at the Wischaw furnace, and its successful operation has been attested by the manager of the works, Mr. Galbraith, before the West of Scotland Iron and Steel Institute. At the same meeting Mr. James Riley spoke of a 250 H. P. Thwaite engine now in course of installation upon the Continent, but without saying where. * * * * The consumption of the Seraing engine is less than 140 ft. of gas per H. P.-hour, whereas the best boilers, when fed with the same gas, require not less than 700 to 730 feet.

Mr. Greiner calculates that a blast-furnace producing 100 tons of gray iron might supply 2,000 net H. P., even when consuming 40 to 45 per cent. of its gas for the operation of blowers, elevators, pumps and other machinery.

*Thwaite's engine operates upon anthracite coal gas; Greiner's upon coke-furnace gas, averaging only 42 to 52 B.T.U. per cu. ft.

Power Plant of the Gold Wave Mine, Congress, Ariz.

The last issue of "Compressed Air" contains an account of an installation of an air compressor, a gasoline engine and a mine hoist, in which the compressor and the hoist are direct-connected to the shaft of the engine. The engine is a standard Fairbanks-Morse of 30 B. H. P. The shaft of the compressor is direct-connected to the engine shaft by a friction clutch coupling, which permits disconnection as desired. When not in use the compressor may be entirely uncoupled from the engine, thereby allowing the use of the available power for hoisting.

In connection with the hoisting part of the machinery the engine is supplied with an automatic speed regulating device. A foot pedal is conveniently placed which communicates with the governor, and when no pressure is exerted upon it the engine runs at a maximum speed of about 70 revolutions per minute. This pedal being pressed down immediately increases the speed of the engine to normal.

The compressor is fitted with a mechanical unloading device, which, when the desired pressure has been attained, holds open the admission valve and prevents compression. When this unloading occurs the load on the engine is immediately reduced and the governor automatically cuts down the supply of fuel in proportion to the demand for power.

The hoister employed is known as a flat faced friction hoist. On the opposite side from the compressor the engine shaft is extended to receive two flat friction rollers; these rollers bear on two iron surfaces which form the sides of the rope drum, the rollers thus acting on either side of the drum. The drum is carried on two eccentric boxes and its movement horizontally is controlled by a lever which works in a quadrant. When it is desired to operate the hoist the drum is shifted into contact with the friction rollers by manipulating the controlling lever and the drum is made to revolve. The cylinder and head of the compressor are both water jaceketed, relieving the air of much of the heat of compression.

The Sale of the Boyden Brake Company.

The assets and business of the Boyden Brake Company have been purchased by the Westinghouse Air Brake Company. Various alleged particulars as to price, etc., have been published, but we have received no information which we dare to print as correct other than the mere fact that the terms of sale have been arranged.

The Locomotives of the Pennsylvania System.

A statement has been going the rounds that hereafter all new locomotives for the Pennsylvania Railroad and the Pennsylvania Lines West of Pittsburgh are to be built at Altoona and that the Western shops will only do repair work. As a matter of fact, all engines now building for the Lines West of Pittsburgh are being built at Altoona, and this has been true since the panic of 1893. Obviously, the future policy must be determined by the demands and the conditions of the time.

Why Air Brakes Are Cut Out.

We have published several of Mr. Thomas' monthly reports of air brake cars cut out in the Nashville yard of the Nashville, Chattanooga & St. Louis Railway. The following is his report of air brake cars cut out in May:

Number of air brake cars forwarded from Nashville yard	3,974
Air brake cars O. K.	3,922
Air brake cars cut out	52
Average serviceable air brake cars to train	7.1
Of the 52 cars cut out, there were:	
Triple valves out of order—	
Air Brake Company No. 4	27
Quick action in service application—	
Air Brake Company No. 1	7
Triple valves blow through emergency port—	
Air Brake Company No. 1	1
Triple valves blow through exhaust port—	
Air Brake Company No. 1	1
Air Brake Company No. 2	1
Broken check valve case—	
Air Brake Company No. 5	1
Sand hole in triple valve body—	
Air Brake Company No. 5	1
Broken triple valve body—	
Air Brake Company No. 1	1
Cylinder release spring broken	5
Broken main cylinder piston	1
Sand hole in reservoir	1
Bursted reservoir	1
Broken train pipe	3
Release valve broken off in reservoir	1
Total	52

Of the 52 cars cut out—
18 belong to railroad companies,
34 to private car lines.
Of the air brake cars forwarded—
201 were equipped with apparatus of Air Brake Company No. 1,
6 with apparatus of Air Brake Company No. 2,
34 with apparatus of Air Brake Company No. 3,
3,731 with apparatus of Air Brake Company No. 5,
2 with apparatus of Air Brake Company No. 6.

Rails Bent by Heat.

Last Sunday (which, as every one knows, was a day of extraordinary heat) a member of the editorial staff of the Railroad Gazette had an opportunity to see the effect on track of the expansion of rails under heat. The train in which he was traveling was stopped because about 60 feet of track had been thrown some 11 inches out of line. The gage was not much disturbed, but both rails and the ties were swung out. We are told that on a neighboring railroad somewhat similar conditions were found in at least five different places. We shall be obliged to any of our readers who will send us particulars of like occurrences elsewhere.

THE SCRAP HEAP.

Notes.

The Hotel Roanoke, at Roanoke, Va., owned by the Norfolk & Western Railroad, was burned down on July 1. Loss, $100,000.

The Columbus, Hocking Valley & Toledo now requires a medical examination of all persons entering the train service. This is entirely independent of the Employees' Benefit Association.

A passenger train of the Texas & Pacific was stopped by robbers near Stanton, Tex., on the night of July 1 and the express car was blown to pieces with dynamite. The safe was robbed, but the amount taken is not definitely stated.

On Tuesday of this week it was announced at St. Paul that the Northern Pacific had restored the wages of trainmen to the rates prevailing before the reduction which was made in 1894. It is stated that the enginemen and conductors will receive an increase of about 15 per cent.

On the Southwest System of the Pennsylvania Lines West of Pittsburgh each class of passenger trains, through, local and suburban, has a separate series of numbers. Through trains are all numbered below 30, local passenger trains from 30 upward and suburban trains from 100 upward.

An officer of the Atchison, Topeka & Santa Fe tells a reporter that it will cost the company $25,000 a year for revenue stamps on checks used in paying employees. The company contemplated running a pay car and paying in cash, which was the custom throughout its lines until a year or two ago, but it has been decided to continue paying by check.

On the South Fork Branch of the Pennsylvania road, a seven-mile line connecting with the main line at South Fork, Pa., the train despatcher sends his orders to freight trains by telephone. There are only two passenger trains each way daily, and most of the time there is only one freight engine on the line under steam. This is the basis, so far as there is a basis, for the newspaper statements that large numbers of telegraph instruments have been taken out by the Pennsylvania and operators discharged, at a saving of thousands of dollars annually. The telegraph was never used on the South Fork Branch.

Street Railroad Receipts in 1896 and 1897.

The Street Railway Journal's financial supplement, "American Street Railway Investments," contains in the 1898 edition, just published, an interesting comparison of the gross receipts for 1896 and 1897, of the principal American street railroad properties, 175 in number. According to the figures given, there are no less than 26 properties earning $1,000,000 or more; 19 earning from $500,000 to $1,000,000; 46 earning from $100,000 to $500,0000, while the figures for 84 properties earning less than $100,000 are included in the comparisons. In the first group, including the principal street railroad properties of the country, the gross receipts for 1897 were 2.2 per cent. greater than the receipts for 1896; in the second group, the receipts decreased 0.11 per cent.; in the third group, comprising 46 properties, earning from $100,000 to $500,000, the receipts increased as a whole 1.67 per cent.; and with the smaller systems there was but a slight variation

in the receipts for the two years. The entire 175 properties, which are presented in tabular form in the "Red Book," show an increase in receipts of 1.9 per cent. in 1897, as compared with 1896. These increases are all much smaller than those shown in 1896 over 1895. In these two years the difference in gross receipts was 7.4 per cent. of the 1895 figures. Although these comparisons are for a portion only of the street railroads of the country, they seem to indicate that all roads have just held their own in 1897, but have done little more than this, and have not kept up the rate of increase promised by the reports of last year.

Stock of the General Electric Company.

The directors of the General Electric Company held a meeting on July 1 in New York, at which time the stockholders recommended a reduction in the value of the common and preferred stock of the company, so that each holder of 100 shares of present stock will receive 60 shares of the new stock. The plan adopted contemplates the payment from the surplus earnings of the company of the accrued dividends on the preferred stock. On the basis of the new capital, $1,275,000 will be required annually to pay 7 per cent. on the preferred stock and 6 per cent. on the common. A special meeting has been called for Aug. 10 to act on the question of the reduction. The outstanding stock is: Common, $30,460,000; preferred, $4,252,000.

South American Notes.

The Buenos Ayres Great Southern Railroad is about to begin the construction of the works for its commercial port at Bahia Blanca. The Directors of this road have been authorized to increase the nominal capital of the company by £4,000,000 to provide for the purchase of the Ensenada Port Railroad, for extensions of the system, and for building the Bahia Blanca port works. The present capitalization is £10,574 per mile, which, with its mileage of 1,499, would make £15,850,426.

The long-talked-of Grand Central Station for the city of Buenos Ayres may at last be built. The Rosario Railroad Co. has made a proposal to the Government which is said to be receiving favorable consideration.

The Sorocabana & Ituana Railroad, in São Paulo, Brazil, reports an improvement in traffic for 1897 of $146,596, the net earnings having amounted to $471,967. The working expenses were 54.75 per cent. of the gross receipts. This road has now 542 miles open to traffic and is building 27 miles. It also operates 142 miles of waterway. Four Baldwin locomotives were added to the rolling stock last year, and further additions are contemplated.

During the year 1897 the total carrying trade of Rio de Janeiro conducted in foreign bottoms was distributed as follows: 48 per cent. British, 17 per cent. French, 11 per cent. German, 11 per cent. Italian, 4 per cent. Swedish and Norwegian, 2 per cent. American, 7 per cent. miscellaneous. The total number of vessels cleared was 2,711, with a registered tonnage of 2,922,529 tons.

The city of Callao, Peru, the port of Lima, has decided to build water and drainage works at an estimated cost of $300,000. The Government has authorized the assignment of 1 per cent. of the Callao custom house receipts toward these improvements. Foreign contractors are invited to submit tenders. According to Federico Moreno, of Lima, the sanitary condition of Callao is one of the worst in the world. The average number of deaths per thousand inhabitants during the present decade has been 86.64 per annum, and the excess of deaths over births for a period of seven years has been 3,500.

According to "El Fonógrafa," of Medellin, Republic of Colombia, a contract has been entered into between the state of Antioquia and Jose Maria Sierra, S., whereby the latter is to loan the state the sum of $500,000 to be applied to building the Antioquia Railroad. The money is to be delivered in 35 monthly payments of $14,000 each and a final one of $10,000. As advance payment of interest is not required, the state grants to Señor Sierra free transportation for salt over the line of the road to Medellin for a period of 40 months.

It is reported from London that a powerful syndicate is being formed for the development of the rubber forests of Eastern Bolivia. Part of the plans of this syndicate is building a railroad from Santa Cruz, Bolivia, to navigable water on the Rio Paraguay. This would be an important link in the long discussed transcontinental railroad from Rio de Janeiro to the west coast of South America. Students of South American affairs have persistently pointed out that a road through the Brazilian states of Goyaz and Matto Grosso is essential for the development of the great interior of the southern continent. The Santa Cruz-Paraguay line would seem to be in the right location.

The Compañia Huanchaoc de Bolivia has sent out engineers to make a reconnoissance of the Sayiri road with the object of determining the conditions to be met in building a railroad from Oruro to Cochabamba. This would form an extension of the Antofagasta & Bolivia railroad. It is reported that the Huanchaco company has encountered rich ore outside of the flooded portion of its mines which has relieved its financial embarrassment.

Superintendent of Grade Crossings.

The New York State Railroad Commissioners have established a Grade Crossing Bureau, and have appointed Mr. A. H. Sutermeister of Troy Superintendent of it. This bureau will deal with applications for appropriations from the state fund under the law of 1897, for separating grades at crossings of railroads and highways. E. M. LeMunyan of Hornellsville and James Brazie of Middletown have been appointed temporary assistants to the Superintendent.

The Supplyman's Poem.

The Browning of the trade is selling locomotive headlights. This is his convention poem:

The lightning bug is brilliant,
But he hasn't any mind;
He blunders through existence
With his headlight on behind.

The Capital of the General Electric Co.

The Directors of the General Electric Company have decided to recommend to the stockholders a reduction in the share capital of the company, both common and preferred, of 40 per cent., so that each holder of 100 shares of present stock will get 60 shares of the new stock. This settlement, while satisfactory to the common stockholders, is regarded as particularly favorable to the preferred shareholders, inasmuch as it will render unnecessary steps for the liquidation of the company, in which event the preferred stockholders would receive only the same amount as the common stockholders, and no back dividends. The plan now adopted contemplates the payment from the surplus earnings of the company as they are hereafter made, of the accrued dividends on the preferred stock. On the basis of the new capitalization $1,275,000 will be required annually to pay 7 per cent. upon the preferred stock and 6 per cent. upon the common stock. The stockholders' meeting will be held Aug. 10, at Schenectady.

A Swindler.

A man representing himself as a railroad conductor, suffering from injuries received in an accident, going by the name of A. B. Potter or A. Potter, is obtaining transportation by misrepresentation. At last accounts he was at Fort Wayne, representing himself to be a conductor in the employ of the Erie Railroad. He has also claimed to be in the service of the Long Island Railroad, and to be a relative of General Superintendent W. F. Potter. All these representations are fraudulent.

Pullman Stock Dividend.

The directors of Pullman's Palace Car Company on July 1 declared a quarterly dividend of $2 and a special dividend of $20 a share; and recommended that the stockholders at the regular annual meeting on Oct. 13 declare a stock dividend of 50 per cent.; in other words, to issue $18,000,000 new stock, to represent that much of the surplus assets of the company. The capital stock now amounts to $36,000,000, and this will increase it to $54,000,000. The directors recommend that hereafter the dividend be regularly 6 per cent. per annum. The stock has been selling at about 211, and it is estimated that after the payment of the three dividends it will be worth 127. The surplus at the beginning of the current fiscal year was $27,505,959.

Concerning the Use of Patented Articles.

Under date of July 1 the following circular is issued by Mr. Robert Gillham, General Manager of the "Port Arthur Route" (Kansas City, Pittsburgh & Gulf, Kansas City & Northern Connecting, Omaha, Kansas City & Eastern, Omaha & St. Louis and Kansas City Suburban Belt):

"We have been called upon at various times to pay damages resulting from our having unlawfully used articles infringing patented devices, therefore the following instructions must be rigidly observed by all concerned.

"Before any improvements are put into use on these lines, full detailed drawings of the same must be submitted to the Purchasing Agent, who will have a careful investigation made regarding all questions of infringement, and report result of inquiry to the undersigned, who will issue to the proper department additional instructions. This company is a member of the Western Railroad Association, whose particular business is to investigate matters of this kind.

"The practice of various persons allowing manufacturers or dealers to ship articles for trial will also be discontinued from and after this date. If it is desired to make a trial of any article of supposed merit, regular requisition for such article for trial purposes will be made in the regular manner provided for and the arrangements for the trial will then be completed by the Purchasing Agent."

LOCOMOTIVE BUILDING.

The Baldwin Locomotive Works are building two electric mining locomotives.

The Atchison, Topeka & Santa Fe is building a few heavy pusher locomotives at its Topeka shops.

The Baldwin Locomotive Works are building one small engine for the Goodwill Coal & Coke Co.

The Monterey & Mexican Gulf is in the market for 100 box cars of 60,000 lbs. capacity and three caboose cars.

The Baldwin Locomotive Works have an order for four more locomotives for the Ottawa, Arnprior & Parry Sound.

The Wheeling Bridge & Terminal has placed an order with the Pittsburgh Locomotive & Car Works for one locomotive.

The Detroit, Grand Rapids & Western has placed an order with the Dickson Locomotive Works for two 10-wheel freight engines.

The Schenectady Locomotive Works are building four eight-wheel engines, with 20x26-in. cylinders, for the Cleveland, Cincinnati, Chicago & St. Louis for service on fast passenger trains.

The Chicago, Rock Island & Pacific is building at its Chicago shops six simple 8-wheel locomotives with 19½ x 26 in. cylinders and 78 in. driving wheels. They will weigh 125,000 lbs., with 83,000 lbs. on the drivers and have radial stayed boilers; 200 lbs. working steam pressure; firebox, 9 ft. long, 2 ft. 8⅞ in. wide; tank capacity, for water, 4,000 gals., and coal, eight tons. Westinghouse brakes, Cambria axles, Gollmar bell ringers, Janney couplers, Monitor No. 9 injectors, Ashton valves, Leach sanding devices, Nathan lubricators, Scott springs, Midvale tires, cast steel wheel centers and railroad company's piston and valve rod packings will be used.

In our last issue we stated that the Baldwin Locomotive Works had received an order to build 10 more engines for New Zealand. These will be double end tank engines with 14 x 20 in. cylinders, 40 in. driving wheels, have pony trucks, front and rear and side tanks, and weigh in working order about 85,000 lbs., with about 60,000 lbs. on the drivers. The 10 first ordered and referred to in our issue of May 27 will be 10-wheel engines of 3 ft. 6 in. gage, with 16 x 20 in. cylinders and 49 in. driving wheels, and have an eight-wheel tender of 2,000 gals. capacity. These will have Standard steel tires and wrought centre truck and tender wheels. The 20 engines will be fitted with Westinghouse brakes.

A report which has recently been going the rounds of the daily papers to the effect that the Interoceanic railroad of Mexico is in the market for 10 locomotives and 1,000 freight cars, has got into the columns of two railroad papers. The facts are that a report to this effect was published in a Mexican paper last May, and the Railroad Gazette published it at that time, giving credit to the Mexican paper. We later learned that the figures were incorrect, and should have read 10 locomotives and 100 freight cars. An order for eight engines was given to the Schenectady Locomotive Works by Henry E. Walker, Locomotive and Car Superintendent of the road, who came to the United States in the middle of April, and 100 cars were bought, 75 from the St. Charles Car Co. and 25 from the Missouri Car & Foundry Co. A brief description of the engines was given in our issue of June 17.

CAR BUILDING.

The Oregon Short Line will buy five passenger cars.

The Monterey & Mexican Gulf is in the market for six freight engines.

The West Virginia Central & Pittsburgh is in the market for 10 passenger cars.

The Wason Mfg. Co. is building two freight cars for the New England Gas & Coke Co.

The Houston, East & West Texas has placed an order for 50 freight cars with the Pullman Palace Car Co.

The Barney & Smith Car Co. has an order for two passenger cars for the Newfoundland, Northern & Western.

The Washington County has given a contract to Jackson & Sharp for 10 coaches and three combination and four baggage cars.

In reference to the report that the Interoceanic of Mexico is in the market for 1,000 freight cars, see Locomotive Building Column.

The Northern Pacific has placed an order with the Illinois Car & Equipment Co. for 500 box cars, 36 ft. long and of 70,000 lbs. capacity.

The Wabash has given an order for seven cars for passenger service to the St. Charles Car Co. and for three to the Barney & Smith Car Co.

The Wabash has ordered 1,000 box cars, 500 from the St. Charles Car Co. and 500 from the Missouri Car & Foundry Co. It is reported that the road will order 1,000 more.

O. H. Duerr of South Bethlehem, Pa., who has the contract for ballasting certain sections of the Lehigh Valley Railroad, has given an order to the Wells & French Co., for 40 Standard ballast cars.

It is reported that the Chicago, Milwaukee & St. Paul will build 1,000 more box cars at the West Milwaukee shops, but we have been unable to get official information up to time of going to press.

The 100 flat cars being built by Barney & Smith Car Co. for the Southern Indiana, and referred to in our issue of June 24, will be of 60,000 lbs. capacity, 34 ft. long and 8 ft. 9 in. wide and equipped with Westinghouse air brakes, M. C. B. lead lined brasses, Hein automatic couplers, American continuous draft rigging, cast iron journal boxes with Morris lids, Pennsylvania two-coil, ¾x1½ in. steel springs, rigid diamond trucks and 33 in. wheels.

The freight cars for the Choctaw, Oklahoma & Gulf, mentioned in our issue of June 3, have been ordered from the Mt. Vernon Mfg. Co. The order is for 218 coal cars, 30 ft. long, and 50 box cars, 35 ft. long, all of 60,000 lbs. capacity, and three cabooses, 30 ft. long. The coal cars will have Westinghouse air brakes, Tower couplers, Simplex bolsters, Butler drawbar attachments and National springs; the box cars to have the same equipment with Lawler doors and fastenings and Excelsior inside iron roofs.

The Philadelphia & Reading has placed orders for 1,000 hopper bottom coal cars of 60,000 lbs. capacity, 200 with the Lebanon Car Mfg. Co., Lebanon, Pa.; 200 with the Jackson & Woodin Co., of Berwick, Pa.; 100 with the Middletown Car Works, Middletown, Pa., and 500 with the Union Car Co., of Depew, N. Y. These will be fitted with Fox trucks, either Fox or Schoen body bolsters, Gould couplers, Davis Pressed Steel Co.'s pressed steel corner bands, stake pockets and box lids, Pickering and Scott springs and King patent hoppers.

The 100 flat cars to be built for the Detroit & Mackinac by the Michigan-Peninsular Car Co., and referred to in our last issue, will be of 60,000 lbs. capacity, 36 ft. long, 8 ft. 6 in. wide, and weigh, approximately, 22,300 lbs. They will be equipped with Carnegie steel axles, wrought iron bolsters, Congdon brake shoes, Westinghouse air brakes, cast iron journal boxes, with Q. & C. Co.'s pressed steel lids, Fulton Iron & Engine Works' brasses, Detroit Steel & Spring Co.'s springs, diamond frame trucks with rigid bolsters and Michigan-Peninsular Car Co.'s cast iron wheels, 33 in. in diameter. They are for August delivery.

The Metropolitan Street Railway Co. (New York City) has placed an order with the J. G. Brill Co. for 100 closed cars.

The Third Avenue road (New York City) has placed a norder with the J. G. Brill Co. for 76 closed electric cars.

The Brooklyn Elevated has given an order to the Baldwin Locomotive Works for 20 double sets of motors for September delivery.

The Brooklyn Heights has placed an order for 30 closed cars with the St. Louis Car Co., and for 10 with the American Car Co. and will build 20 at its own shops.

The Baltimore Consolidated has ordered 75 combination cars, 21 ft. long, from the J. G. Brill Co., and 75 closed motor cars, 20 ft. 8 in. long, from the Brownell Car Co. Westinghouse No. 49 A motors and Lord Baltimore trucks, made by the Baltimore Car Wheel Co., are specified.

BRIDGE BUILDING.

ASSUMPTION, ILL.—Press reports state that five small steel bridges will be built.

CHEHALIS, ORE.—The County Commissioners have decided to build two bridges across the Chehalis River this summer at estimated cost of $3,000 and $4,000. The more expensive one will be 300 ft. long, and in addition to the bridge proper a half mile of trestle work will be built at an estimated cost of about $10,000.

CINCINNATI, O.—Bids will be received until July 27 for building a bridge over Mill Creek, near Carthage, Springfield Township. Eugene L. Lewis, Auditor, Hamilton County.

DUBUQUE, IA.—Dubuque County will build a steel bridge at Worthington, it is stated.

FAIRFAX, VT.—A new bridge will be built over Mill Brook, and it is not decided yet whether or not it will be a wooden or an iron bridge.

JANESVILLE, WIS.—Rock County will soon ask for bids for building three iron bridges near Janesville. The largest will be a 100 ft. span across Turtle Creek, in the town of Bradford.

MANCHESTER, N. H.—In the plans for the Ocean Boulevard, along the New Hampshire coast line, are included three bridges, one over a river and two over estuaries. The plans and estimates are completed for the road, and will be submitted to the Governor and Council at their next meeting.

MORA, MINN.—The Commissioners of Kanabec County will build two bridges to cost about $2,000 each.

MT. MORRIS, N. Y.—Thomas Cabrey, Highway Commissioner, is authorized to build a small iron bridge over the stream on the State Line road.

NEW WHATCOM, WASH.—The contract for building the bridge across Nooksack River at the crossing of Puget Sound, Meridian, has been given to Savage & Scofield. The contract for building the approaches to the Guide Meridian Bridge across Nooksack River was granted to C. W. Worthen, provided he furnished satisfactory bonds.

PHILADELPHIA, PA.—The Broad Street Bridge over the Reading Railroad Subway at Callowhill street has been completed and the bridge has been thrown open for traffic. The structure is 265 ft. in length, 157 ft. wide, including sidewalks, which take up 44 ft.

RUMFORD, ME.—It is stated that $16,000 is appropriated for building a bridge at the head of Rumford Falls.

SILVER CREEK, N. Y.—The Western New York & Pennsylvania road is replacing its wooden trestle at Silver Creek with an iron bridge. The tracks at the point where they cross Silver Creek are about 75 ft. high.

SOUTH BEND, IND.—Press reports state that the Jefferson street bridge will be rebuilt. The St. Joseph County Board has been petitioned to build a bridge at Sample street.

SUPERIOR, WIS.—The Eastern Railway of Minnesota served notice on the city that it would build the viaduct over the tracks on Twenty-first street at once.

TOPEKA, KAN.—A new bridge is talked of to be built across Shunganunga Creek.

WASHINGTON, D. C.—A bill has been introduced in the House appropriating $300,000 for a bridge across the Anacostia River in line with South Capitol street.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Boston & Providence.—Guaranteed, quarterly, 2½ per cent., payable July 1.
Cincinnati, Hamilton & Dayton, A. & B.—Quarterly, 1 per cent., payable July 5.
Connecticut River.—Five per cent., payable July 1.
Dayton & Michigan.—Preferred, guaranteed, quarterly, 2 per cent., payable July 5.
Detroit, Hillsdale & Southwestern.—Two per cent., payable July 5.
Dubuque & Sioux City.—Two per cent., payable June 30.
Little Schuylkill Nav., R. R. & Coal.—Two and a half per cent., payable July 12.
Maine Central.—Quarterly, 1½ per cent., payable July 1.
New London Northern.—Quarterly, 2¼ per cent., payable June 30.
Norwich & Worcester.—Quarterly, 2 per cent., payable July 1.
Old Colony.—Quarterly, 1¾ per cent., payable July 1.
Pittsfield & North Adams.—Two and one-half per cent., payable July 1.
Portland, Saco & Portsmouth.—Three per cent., payable July 15.
Southwestern (Ga.).—Two and one-half per cent., payable July 5.
Ware River.—Three and one-half per cent., payable July 6.
Worcester, Nashua & Rochester.—Two and three-fourths per cent., payable July 1.

Baltimore Consolidated.—Two per cent., payable July 15.
able July 9.
Brockton (Mass.).—Quarterly, 1½ per cent., payable July 1.
Canal & Clayborne (N. O.).—Four per cent., payable on demand.
Federal St. & Pleasant Valley (Pitts.).—Two and one-half per cent., payable July 22.
Hartford St. Ry. (Conn.).—Quarterly, 1½ per cent., payable July 1.
Holyoke (Mass.).—Quarterly, 4 per cent., payable June 30.
Interstate Consol (North Attleboro, Mass.).—Quarterly, 1½ per cent., payable July 1.
Lowell, L. & Hav.—Quarterly, 1 per cent., payable
Metropolitan (N. Y.).—One and one-quarter per cent., payable July 15.
National (St. Louis).—Quarterly, 1½ per cent., pay-July 1.
New London (Conn.) St.—Two and one-half per cent., payable July 1.
Newton (Mass.) St.—Quarterly, 2 per cent., payable July 15.
Norfolk Suburban (Hyde Park, Mass.)—Three and one-half per cent., payable July 15.
Northampton (Mass.) St.—Four per cent., payable June 30.
Norwich (Conn.) St.—One per cent., payable July 1.
Taunton & Brockton.—Quarterly, 2 per cent., payable July 1.
Twin City Rapid Tran. (Minn.).—Preferred, 1¾ per cent., payable July 1.
Wellesley & Boston.—Quarterly, 1½ per cent., payable July.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

American Society of Civil Engineers.—Meets at the house of the society, 220 West Fifty-seventh street, New York, on the first and third Wednesdays in each month at 8 p. m.
American Society of Railroad Superintendents.—Annual meeting, Crossman House, Alexandria Bay (Thousand Islands), N. Y., July 13 and 14.
Association of Engineers of Virginia.—Holds its formal meetings on the third Wednesday of each month from September to May, inclusive, at 710 Terry Building, Roanoke, at 5 p. m.
Boston Society of Civil Engineers.—Meets at 715 Tremont Temple, Boston, on the third Wednesday in each month at 7.30 p. m.
Canadian Society of Civil Engineers.—Meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday at 8 p. m.
Central Railway Club.—Meets at the Hotel Iroquois, Buffalo, N. Y., on the second Friday of January, March, May, September and November, at 2 p. m.
Chicago Electrical Association.—Meets at Room 7,137, Monadnock Building, Chicago, on the first and third Fridays of each month at 8 p. m. J. R. Cravath, secretary.
Civil Engineers' Club of Cleveland.—Meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.
Civil Engineers' Society of St. Paul.—Meets on the first Monday of each month except June, July, August and September.
Denver Society of Civil Engineers.—Meets at 3 Jacobson Block, Denver, Col., on the second Tuesday of each month except during July and August.
Engineers' Club of Cincinnati.—Meets at the rooms of the Literary Club, 25 East Eighth street, on the third Thursday of each month, excepting July and August, at 7.30 p. m.
Engineers' Club of Columbus (O.).—Meets at 12½ North High street on the first and third Saturdays from September to June.
Engineers' Club of Minneapolis.—Meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.
Engineers' Club of Philadelphia.—Meets at the house of the club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month at 8 p. m., except during July and August.
Engineers' Club of St. Louis.—Meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St. Louis, on the first and third Wednesdays in each month.
Engineers' Society of Western New York.—Holds regular meetings on the first Monday in each month, except in the months of July and August, at the Buffalo Library Building.
Engineers' Society of Western Pennsylvania.—Meets at 410 Penn avenue, Pittsburg, Pa., on the third Tuesday in each month at 7.30 p. m.
Locomotive Foreman's Club.—Meets every second Tuesday in the clubroom of the Correspondence School of Locomotive Engineers and Firemen, 335 Dearborn street, Chicago.
Montana Society of Civil Engineers.—Meets at Helena, Mont., on the third Saturday in each month at 7.30 p. m.
National Railroad Master Blacksmith Association.—Sixth annual convention, Boston, Sept. 6.
New England Railroad Club.—Meets at Pierce Hall, Copley Square, Boston, Mass., on the second Tuesday of each month.
New York Railroad Club.—Meets at 12 West Thirty-first street, New York City, on the third Thursday in each month at 8 p. m., excepting June, July and August.
Northwest Railway Club.—Meets on the first Tuesday after the second Monday in each month at 8 p. m., the place of meeting alternating between the West Hotel, Minneapolis, and the Ryan Hotel, St. Paul.
Northwestern Track and Bridge Association.—Meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2.30 p. m.
St. Louis Railway Club.—Holds its regular meeting on the second Friday of each month at 3 p. m.
Southern and Southwestern Railway Club.—Meets at the Kimball House, Atlanta, Ga., on the second Thursday in January, April, August and November.
Technical Society of the Pacific Coast.—Meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month at 8 p. m.
Western Foundrymen's Association.—Meets in the Great Northern Hotel, Chicago, on the third Wednesday of each month. A. Sorge, Jr., 1533 Marquette Building, Chicago, is secretary.
Western Railway Club.—Meets in Chicago on the Third Tuesday of each month at 2 p. m.
Western Society of Engineers.—Meets in its rooms on the first Wednesday of each month at 8 p. m., to hear reports and for the reading and discussion of papers. The headquarters of the society are at 1736-1739 Monadnock Block, Chicago.

Western Society of Engineers.

A meeting of the Western Society of Engineers was held in the society rooms, Monadnock Block, Chicago, Wednesday evening, July 6. Mr. Oscar Sanne, Engineer, Milwaukee, Wis., presented a paper entitled "Park Bridges."

PERSONAL.

—Mr. John M. Marstella, who was Master Mechanic at the B. & O. shops at Martinsburg, W. Va., died June 26.

—Mr. M. W. Cooley, Engineer Maintenance of Way on the Toledo & Ohio Central, has been appointed to a position in the Volunteer Engineers, and left for camp this week.

—Mr. James H. Guild, Superintendent of Telegraph on the Oregon Railroad & Navigation Company's lines, died last week, after a long illness. He was born in Williamsburg, L. I.

—Mr. Charles H. Clark, a pioneer in Western railroading, died at his home in San Diego, Cal., June 26. He held the position of Master Mechanic at various points on the Union Pacific in the early days.

—Mr. James S. Smith, Traveling Passenger Agent of the Union Pacific, with headquarters in Boston, died June 28. During his career he had been with the Lake Shore & Michigan Southern, the Kansas Pacific and the Chicago Great Western.

—Brigadier-General G. L. Gillespie, who has had charge of the United States engineering works and harbor improvements in New York and vicinity for some years, is now in command of the Department of the East. He is President of the Mississippi River Commission and Supervisor of Coast Defenses from Portland, Me., to Barnegat, N. J.

—Mr. D. M. Philbin, who was recently elected Second Vice-President of the Eastern Railway of Minnesota, was born in Montreal in 1859 and entered railroad service in 1874 as clerk in the Construction Department of the Chicago & Northwestern. The following year he was on the Engineer Corps, and two years later he had charge of the ore docks of the Chicago & Northwestern at Escanaba, Mich. He held this position until 1886, when he took charge of the ore docks of the Milwaukee, Lake Shore & Western at Ashland. In 1889 and 1890 he was Superintendent of the Eastern Division of the Freemont, Elkhorn & Missouri Valley, and from 1890 to April 11, 1893, he was Superintendent of the Duluth, South Shore & Atlantic. From April 11, 1893, until Jan. 25, 1896, he was General Manager of the Duluth, Missabe & Northern. He afterward held the position of General Superintendent on the Duluth, Superior & Western up to his present promotion.

—In our issue of June 17, we noted the death at sea of Mr. Albert P. Massey, the Mechanical Engineer of the New York Air Brake Co. For two months Mr. Massey had been confined to his house by exhaustion, brought on by long and close attention to business. On June 2 he sailed for England on the steamer Koenigin Luise. On Sunday, June 5, he died from heart failure, and his body was buried at sea. Mr. Massey graduated from the Sheffield Scientific School of Yale University with the class of '65. He was thus one of the older graduates of this well-known institution. While he was born in Watertown, N. Y., in 1842, he went to California and after spending several years there, removed to Cleveland, O. In both of these places he was connected with important industrial works, but it was not until he returned to Watertown thirteen years ago to become the Mechanical Engineer of the Eames Vacuum Brake Co. that his connection with railroad work began. His real introduction to the railroad public came through the now historical brake tests at Burlington in 1886 and 1887, at which tests he was the chief representative of the Eames Vacuum Brake Co. and he was the inventor of their devices. In 1890 his new system was offered to the railroads by the New York Air Brake Co., the successor of the Eames Vacuum Brake Co. While the triple valve has since been changed, the duplex air pump has proved so efficient that it remains practically unchanged to-day. Mr. Massey's experience with the vacuum brakes in use on the elevated roads in New York gave him a very clear understanding of the requirements of a brake for this peculiar service, and when the changed conditions of electrical operation came he was ready with the special reinforced brake which was used so successfully on the Intramural Railroad at the World's Fair, and is now in operation on the Metropolitan Railway of Chicago.

Mr. Massey's ideas as an inventor were never visionary, but showed a clear grasp of the requirements of the work to be performed. In all of his experimental investigations he was extremely thorough, and no matter how interested he might be in a device, as soon as experiments showed that it would not meet all of the requirements he was ready to drop it. He had a mind of remarkable energy and power, and of great activity in a wide range of thought. As he was a very busy man, he was able to spare but little time to society. However, his bright spirits, sweet temper, constant thoughtfulness of others, and true Christian spirit made him ever a pleasant companion, and one beloved by all who were fortunate enough to have any relations with him. He will thus be greatly missed, not only by a wide circle who had learned to respect him as a mechanical engineer and inventor, but had learned to love him for his many sterling qualities.

ELECTIONS AND APPOINTMENTS.

Atlantic Coast Line.—R. E. Smith, who was Superintendent of Motive Power, has been appointed Assistant to the General Manager. T. H. Symington succeds Mr. Smith as Superintendent of Motive Power.

Baltimore & Ohio.—William Gibson, formerly Assistant General Superintendent main stem Philadelphia and Pittsburgh Division, has been appointed Superintendent of the new division on the B. & O., known as the Pittsburgh Division. This includes the Pittsburgh-Wheeling and Pittsburgh-Connellsville sub-divisions under Superintendent John Barron, and Connellsville-Cumberland division under Superintendent J. S. Morris. There are now three main divisions on the B. & O.

Arthur Sinclair has been appointed the Local Contracting Agent at Baltimore, Md., succeeding Thomas J. Conroy, resigned.

George W. Schofield, Master Painter, has resigned to accept a position as Superintendent of the Painting Department of the Standard Oil Co.

Boston & Maine.—J. Hadley Fullerton, Supervisor of Buildings and Bridges on the Southern Division, has been appointed to a similar office on the Northern Division, with headquarters at Woodsville, N. H.

Central of New Jersey.—W. W. Wentz, Jr., lately Secretary and Purchasing Agent of the Louisville, Evansville & St. Louis, has been appointed Assistant Superintendent of the C. of N. J., Lehigh and Susquehanna Division, with headquarters at Mauchchunk, Pa.

Chicago & Northwestern.—An office of the company was opened in Pittsburgh similar to those in New York, Boston and other large cities. It will be the headquarters of A. Q. Tallant, whose headquarters was formerly in Cincinnati, O., as General Agent of the Freight Department. Charles Traver, Traveling Passenger Agent for the Pittsburgh and Western District, and Frank Irish, Traveling Passenger

Agent east of Pittsburgh, will also make the new office in Pittsburgh their headquarters.

Chicago, Peoria & St. Louis.—J. W. Sweeney, Assistant Division Roadmaster of the Chicago & Alton, has been appointed General Roadmaster.

Cincinnati & Muskingum.—Under the reorganization the officers are James McCrea, President; Joseph Wood, Vice-President; S. B. Liggett, Secretary; T. H. B. McKnight, Treasurer; John W. Renner, Auditor; C. M. Bennett, Superintendent.

Cincinnati, Hamilton & Dayton.—I. S. Anderson, formerly with the Michigan Central of Detroit, has been appointed General Yardmaster of the Cincinnati, Hamilton & Dayton at Toledo, to succeed H. C. Chappel, who recently resigned.

Cincinnati, New Orleans & Texas Pacific.—George W. Stevens has resigned as Purchasing Agent and Superintendent of Car Service. G. B. Nicholson, Chief Engineer, in addition to his present duties, is appointed Purchasing Agent. The office of Superintendent of Car Service has been abolished. C. H. Davis, Auditor, will take charge of the car records. The distribution of equipment will from July 1 be in charge of Division Superintendents.

Detroit & Lima Northern.—Charles N. Haskell has been elected Vice-President.

Detroit, Toledo & Milwaukee.—The office of Assistant Treasurer, held by L. M. Sturdevant, Toledo, O., has been abolished. A. L. Richmond, Auditor, has been appointed to discharge the duties of that office.

N. K. Elliott, Superintendent, and Chief Clerk Frederick Franks have resigned.

Horace S. Rearden, at one time Superintendent of the Chicago, Peoria & St. Louis, has been appointed General Superintendent of the D., T. & M., with headquarters at Toledo, O. He succeeds N. K. Elliott, resigned.

Eastern Railway of Minnesota (G. N.)—D. M. Philbin has been elected Second Vice-President, with headquarters at Duluth, Minn. Mr. Philbin was formerly General Superintendent of the Duluth, Superior & Western at Duluth, which has been absorbed by the Eastern.

Erie.—Charles A. Brunn, Superintendent of the Buffalo Division, has been appointed Assistant General Superintendent. The management of the Union Steamboat Line and Union Dry Dock, Buffalo, formerly handled directly by the President, E. B. Thomas, was transferred to the Operating Department on July 1 and placed in charge of Mr. Brunn. The office of General Manager of these auxiliary companies, held by Charles Paine, has been abolished. Mr. Brunn will continue to make Buffalo his headquarters.

Florida Central & Peninsular.—M. L. Williams, formerly Chief Train Dispatcher, succeeds M. V. Raley as Trainmaster at Savannah, Ga. (June 24, p. 466.)

Galveston, Laporte & Houston.—T. W. House was elected sole receiver in the place of M. T. Jones, deceased.

Great Northern.—The division headquarters of the Cascade Division and for the Coast lines has been removed from Leavenworth to Everett.

Illinois Central.—M. S. Curley has been appointed Master Mechanic of the I. C. shops at Water Valley, Miss.

Intercolonial.—General Traffic Manager A. H. Harris, who was recently appointed to that position, has resigned. The Minister of Railways and Canals has decided to close the office on August 1. Division Superintendent James E. Price has been appointed Assistant General Manager.

Iowa Central.—W. G. Martin has been appointed General Passenger Agent, vice T. P. Barry, resigned.

Louisville, Henderson & St. Louis.—P. Cain has been appointed Traveling Engineer, with headquarters at Cloverport, Ky.

Mexico, Cuernavoca & Pacific.—J. M. Brash, Auditor and Assistant Treasurer, has resigned the position of Assistant Treasurer, but continues to hold that of Auditor. J. O. Rice is appointed acting Assistant Treasurer.

Minneapolis Eastern.—The annual meeting of this road was held at Minneapolis and the following Directors were elected: Roswell Miller, J. S. Pillsbury, Thomas Wilson, W. H. Norris, W. A. Scott, W. J. Underwood, J. A. Chandler, L. K. Luce and J. T. Clark. J. S. Pillsbury was re-elected President, and W. J. Underwood was elected Secretary and Treasurer, succeeding H. R. Williams.

Mobile & Ohio.—George W. Stevens, who resigned his position of Purchasing Agent and Superintendent Car Service of the Cincinnati, New Orleans & Texas, has been appointed Purchasing Agent of the M. & O., succeeding R. H. Duesberry, with headquarters at Mobile, Ala.

Montana Union (N. P.)—The officers of the Northern Pacific have their jurisdiction extended over M. U., which will be operated as a part of N. P. System.

Moscow, Camden & San Augustine.—The Directors of this new company, referred to in the Construction column, are: C. H. Jones, Galveston; J. E. McAshan, Houston; E. J. Mantooth, Lufkin; J. A. Handley, Hortense; S. Bergman and D. L. Jones, Moscow, W. T. Carter, E. A. Carter and J. Thomas, Camden. The officers are: President, W. T. Carter; C. H. Jones, Vice-President; E. A. Carter, Treasurer, and J. Thomas, Secretary.

New York, New Haven & Hartford.—In the reorganization of the N. Y., N. H. & H. we notice the following changes: William E. Barnett, Attorney, formerly Executive Secretary, has charge of the Department of Law, Real Estate and Taxes; George W. Little, Paymaster, with office at New Haven. In the Engineering Department a Principal Assistant Engineer is to be appointed, while L. B. Bidwell is Engineer in charge of the Eastern District, with office at Boston; and S. L. F. Deyo is Assistant Engineer in charge of the Western District, with office at New Haven. In the Freight Department, J. M. Williams is General Freight Agent of the Eastern District, and also of the Marine District at Harlem, N. Y., with office at Boston; George L. Winlock, Assistant General Freight Agent of the Eastern District, and also of the Marine District, with office at Boston; N. A. Willcox, General Freight Agent of the Western District, having charge of the company's freight business by its floating equipment at Harlem River, office at New Haven. In the Transportation Department, N. H. Heft is Chief of Electrical Department, office at New Haven; F. H. Crane, Superintendent of Parlor and Sleeping Cars, office at Grand Central Depot, New York; E. E. Pratt, Superintendent of Buildings, and E. E. Pratt, Jr., Assistant Superintendent of Buildings, offices at New Haven; W. H. Elliot, Fuel Agent, office at New Haven. The Worcester Division, in the Eastern District, F. G. Spencer, Superintendent, includes line between Valley Falls and Franklin. The Midland Division, F. E. Dewey, Superintendent, extends between Fort Point Channel, Boston, and Willimantic; Deadham Junction and Deadham, Franklin Junction and Ashland, Cook Street and Harrisville. J. N. King is appointed Superintendent of the Central Division, between Providence and Willimantic, and Willimantic and Olneyville and Pascoag. In the Western District, T. H. Fennell is appointed Superintendent of the Highland Division, extending between Willimantic and Fishkill, East Hartford and Springfield, Melrose and Rockville, Rockville and Varon. George Peirce is appointed Superintendent of Marine Construction in the Marine District, with office at Newport, R. I.

The administration of the company's business is distributed among the following departments: 1—Executive; 2—Treasury; 3—Accounting; 4—Law, Real Estate and Taxes; 5—Pay; 6—Purchasing; 7—Engineering; 8—Freight; 9—Passenger; 10—Transportation.

In the Transportation Department the General Manager will be assisted by a Superintendent of Motive Power, having charge of all machinery and rolling stock, aided by a General Master Mechanic and a Master Car Builder, a Chief of Electrical Department having charge of the power houses and of the electrical equipment when not in actual service, a Superintendent of Parlor and Sleeping Cars, a Superintendent of Buildings, a Car Service Agent; a Fuel Agent, a General Superintendent for the Eastern, Western and Marine Districts.

Ogdensburg & Lake Champlain.—C. G. Chevalier, General Superintendent, has been appointed Purchasing Agent, in addition to his other duties.

Oregon R. R. & Navigation Co.—E. A. Klippel has been appointed Superintendent of Telegraph, succeeding J. H. Guild, deceased. Mr. Klippel, who has been Manager-Operator at Portland, is succeeded by J. H. Huddleston.

Pennsylvania.—A. H. Kline has been appointed Assistant Master Carpenter of the Middle Division. He had been foreman of carpenters on the Philadelphia Division.

Pennsylvania Co.—P. A. Bonebrake is appointed Superintendent of the Indianapolis Division, vice F. G. Darlington, resigned, with office at Columbus, O. B. W. Taylor is appointed Superintendent of the Louisville Division, vice P. A. Bonebrake, transferred. Mr. Taylor's office is to be at Louisville, Ky. He was previously Engineer Maintenance of Way on the Louisville Division.

The jurisdiction of the Superintendent of the Indianapolis Division is extended to include the yards and terminals of the Pittsburgh & Cincinnati Division at Columbus, O. The jurisdiction of the Superintendent of the Louisville Division is extended to include that portion of the Indianapolis Division between Indianapolis, Ind., and Kokomo, Ind. The jurisdiction of the Superintendent of the Indianapolis & Vincennes Division is extended to include yards and terminals of the Indianapolis and Louisville Divisions at Indianapolis, Ind.

Further appointments are: Engineers Maintenance of Way: William B. Blake succeeds Mr. Taylor on the Louisville Division; R. C. Barnard takes charge on the Richmond Division, Paul Jones on the Indiana & Vincennes Division, and D. B. Johnson on the Cincinnati & Muskingum Valley Division. The following Assistant Engineers Maintenance of Way are appointed: A. A. Wirth, Louisville Division; F. H. Worthington, Indianapolis Division; William D. Wiggins, Western Division; Robert Ferriday, Chicago Division; I. W. Geer, Erie & Ashtabula Division.

Thomas A. Rogers has been appointed Assistant Division Operator of the Cleveland & Pittsburgh Division, succeeding J. G. Jennings, appointed Division Operator of the Pittsburgh, Cincinnati, Chicago & St. Louis.

Pittsburgh & Lake Erie.—B. C. Vaughn, Traveling Passenger Agent, has been appointed Secretary of J. M. Schoonmaker, Vice-President and General Manager of the road, vice Joseph Foster, deceased.

Plant System.—T. S. Tutwiler has been appointed Chief Engineer. W. E. Symons has been appointed Superintendent of Motive Power.

The office of Assistant General Superintendent has been abolished. It has been occupied for 18 years by G. M. D. Riley.

Pullman's Palace Car Co.—A. M. Parent is appointed Manager of the Pullman Works. Appointment was effective July 1. The authority of Assistant Manager Frederick Wild is extended over all departments.

St. Louis & San Francisco.—George H. Foote, District Passenger Agent of the Chicago, Milwaukee & St. Paul at Kansas City, will be Ticket Agent for the St. L. & S. F. at that point. He will not have charge, however, of the business in the Kansas City territory.

St. Louis, Avoyelles & Southwestern.—Nathan G. Pearsall, who was for many years Division Superintendent at New Orleans of the Texas & Pacific, has been appointed General Manager of the St. L., A. & S. He has been connected lately with the Interstate Transportation Co.

Southern Pacific.—C. C. Mallard has been appointed Division Engineer, succeeding Allard D'Heur. Mr. Mallard was formerly Assistant Superintendent Bridge and Buildings at Algiers, La.

Texas & Pacific.—Eben B. Smith was appointed Superintendent of the El Paso Terminal, succeeding Superintendent Stiner, deceased.

Troy Union.—W. H. Van Wie succeeds Superintendent. A. Lutermeister, who was appointed Superintendent of the New York Grade Crossing Bureau.

Union Pacific.—Judge William Cornish, of St. Paul, Special Master in Chancery of the U. P., has been elected its First Vice-President, vice Oliver W. Mink. He will shortly remove his headquarters to New York. Howard S. Abbott, of Minneapolis, has been appointed Master in Chancery to succeed Judge Cornish. General Thomas P. Wilson, of St. Paul, and Oliver W. Mink will act as Successory Receivers for the branch lines of the system, which are still in the hands of receivers. G. M. Lamberton, of Lincoln, Neb., will be attorney for the Successory Receivers.

Robert W. Baxter has been appointed General Superintendent of the Nebraska Division, vice P. J. Nichols, Omaha, Neb. Mr. Baxter was before his promotion General Agent at Portland, Ore.

In the traffic departments on July 1 the following appointments were made: D. W. Johnson, from Detroit, succeeds J. H. Lothrop, General Agent of the freight department at Cleveland, O.; A. J. Ratcliffe, from St. Louis, succeeds D. W. Johnson, Michigan Passenger Agent, Detroit; Arnold S. Borglum, from the Omaha city office, Omaha, succeeds A. J. Ratcliffe, Traveling Passenger Agent, St. Louis; J. O. Goodsell, from General Passenger office, Omaha, succeeds Arnold S. Borglum, Passenger Agent, Omaha City Office; T. C. Wallace, from Indianapolis, succeeds James S. Smith (deceased), Traveling Passenger Agent at Boston; J. H. June, from Boston, succeeds T. C. Wallace, Traveling Passenger Agent at Indianapolis; George I. Humphrey is to succeed J. H. June, Excursion Conductor, at Boston; O. H. Happel is to be City Passenger Agent at St. Louis.

Daniel W. Johnson, Michigan Passenger Agent for the Union Pacific in Detroit, will take charge of the Freight Department for the States of Ohio, Virginia, West Virginia and North Carolina, with portions of Indiana, Pennsylvania and Kentucky. He will make Cleveland his headquarters. A. J. Radcliff, Traveling Passenger Agent at St. Louis, will succeed him.

Velasco Terminal.—E. D. Dorchester, formerly Secretary and Assistant General Manager, has been appointed General Manager. He succeeds the Hon. L. L. Foster, who recently resigned.

Washington & Columbia River.—S. B. Calderhead was appointed General Freight and Passenger Agent July 1, vice Frederick Rogers, resigned.

West Shore.—George A. Pray, Freight Agent, has been transferred from Buffalo to Weehawken. Mr. A. B. Walmsley, Freight Agent at Thirty-sixth street, New York, will be transferred to the Buffalo office.

Wisconsin Central.—L. C. Trow, who has been local Freight Agent of the Chicago & Great Western in St. Paul, has been appointed Freight Solicitor of the W. C. with headquarters in St. Paul.

RAILROAD CONSTRUCTION,
Incorporations, Surveys, Etc.

ALBANY, LEBANON, SODAVILLE & WATERLOO.—Grading is finished, according to report, on this line from Albany, Ore., southeast 21 miles via Lebanon to Waterloo, all in Linn County. Most of the ties are on the ground and it is stated that tracklaying will begin in a few days. M. W. Wilkins of Waterloo is President. This road was incorporated Jan. 8, 1897. (March 12, 1897, p. 194.)

ASHLAND & WOOSTER.—Grading is completed, according to report, on the first mile of contract and about 2,000 ft. of rails is laid on this line from Jewett, O., through Stark County, 52 miles, to Ashland. H. B. Camp, of Akron, O., is President and General Manager. (June 24, p. 466.)

ATLANTIC & LAKE SUPERIOR.—Work is in progress on the extension from New Carlisle, Que., to Pasepebiac, three miles, at which point it is proposed to build a deepwater harbor with wharves, etc. (March 4, p. 167.)

This company has bought from the Canadian Pacific the line between Sorel and Yamaska, Que., including the bridge over the Yamaska River, which will form a part of the A. & L. S. line between Montreal and Levis. Considerable work was done on this portion of the line last season, and the company expects to complete the extension to Levis this year.

BLACK DIAMOND.—The Ghent & Cynthiana was incorporated in Ohio, June 24, as successor to the proposed Ohio River, Cynthiana & Tidewater line of the B. D., with an increase of capital stock from $25,000 to $56,000. This is the system which is being promoted by Albert E. Boone of Zanesville, O. (Nov. 12, 1897, p. 805.)

BUFFALO, ROCHESTER & PITTSBURGH.—All the contracts for grading and bridging have been let on the Allegheny & Western extension from Punxsutawney, Pa., west 98 miles to Newcastle. Jutte & Foley, of Pittsburgh, have the contract for masonry for the 1,500-ft. bridge to span the Allegheny River at Moss Grove. Among the contractors for grading are C. M. Ryan, New York, 12 miles, and Collins, Clemens, King & Rickells, 10 miles, to Butler. On this section there will be a 700-ft. tunnel near Buffalo Mills. Some of the cuts are very heavy. The contract for grading to the Moss Grove bridge was let some time ago. (April 15, p. 285.)

CANADIAN PACIFIC.—A spur is to be built, according to report, from Hartney, Man., east about 20 miles, running parallel to the new Northern Pacific Hartney Branch, now building.

CENTRAL ONTARIO.—This line is to be extended from Coe Hill, Ont., north 18½ miles to Bancroft, but actual building will not be begun this season. The line runs from Coe Hill to Picton.

CHICAGO, ROCK ISLAND & PACIFIC.—Rails are laid for 13 miles of second track on the main line between Farnham, Ia., and Moscow. (March 4, p. 169.) The Flick & Johnson Construction Co., of Davenport, Ia., has the contract for grading. (Official.)

COLUMBIA SOUTHERN.—Track is laid for five miles to Klondike, Ore., on this line from Wasco, south to Moro, 17 miles. It is proposed to extend the line to Prineville, about 120 miles. (May 20, p. 367.)

EASTERN CAROLINA.—This company has been incorporated in North Carolina with a capital stock of $100,000, to build a line in Edgecombe County from Tarboro, N. C., south nine miles to Crisp. The stockholders have elected the following Directors: Victor H. Boyden, Raleigh; B. F. Finney, Savannah, Ga.; A. M. Fairley, Jefferson Cobb, Edward Pennington, Tarboro, N. C.

EAST ST. LOUIS BELT.—Nothing has been done as yet toward making surveys for this line nor has right of way been secured. It is the intention, however, to have the belt connect with each line running into St. Louis. The company was incorporated in Illinois recently with a capital stock of $500,000. E. P. Bryan, Vice-President and General Manager of the Terminal RR. Association of St. Louis, is a Director. (June 24, p. 467.)

GALVESTON, BRAZOS & SOUTHWESTERN.—Grading is finished for 25 miles on this line projected from Galveston, Tex., west about 150 miles to Victor. L. E. Beadle, Galveston, Tex., is Chief Engineer. (May 20, p. 367.)

GILA VALLEY, GLOBE & NORTHERN.—Track has been laid to San Carlos, Ariz., on this line from Geronimo, northeast 58 miles to Globe. William Garland, of Los Angeles, Cal., is President. (May 27, p. 382.)

GRAND RAPIDS & INDIANA.—This company is building a new line between Belmont, Mich., and Rockford, four miles, to do away with six bridges over Rogue River. The river between these two points is crossed seven times, and the bridges having reached a point where renewal was necessary, it was decided to better the line by abandoning the present route and building a new line, thus avoiding all but one of these bridges. The grading is now one-half done, and will be finished by Sept. 1, with about 150 men employed. The contractors are McConnell Bros., Grand Rapids, Mich. The rails, 70-lb. weight, have been bought. No new securities were issued to meet the improvements. (Official.)

GULF, COLORADO & SANTA FE.—Work is completed on the reduction of grades on the main line between Cleburne, Tex., and Ft. Worth, 29 miles. (June 18, 1897, p. 447.) It consisted in reducing southbound grades from 1.3 p. c. to 0.9 p. c. and involved an expenditure of $125,000. (Official.)

JASPER SOUTHERN.—Work has been resumed, according to report, on this line from Kirbyville, Tex., northwest to Jasper, 20 miles. Most of the grading was completed last year. W. W. Blake, Jasper, Tex., is Chief Engineer. (Jan. 21, p. 50.)

KANSAS CITY, ELDORADO & SOUTHERN.—Track is laid for six miles on this proposed line from Walker, Mo., to Eldorado, 15 miles. B. A. Aldrich, 900 Rialto, St. Louis, Mo., is among those interested. (April 8, p. 266.)

KANSAS, OKLAHOMA & SOUTHWESTERN.—A proposition is under consideration in the counties of Pawnee, Payne, Logan and Canadian, Okla. Ter., through which this road is to pass, to give a joint bonus aggregating $200,000. The road is to run from Coffeyville, Kan., southwest to Vernon, Tex. J. H. Bartles of Bartlesville, I. T., is President. (April 22, p. 300.)

LOUISIANA & NORTHWEST.—Track is laid for 10 miles on this line from Magnolia, Ark., southeast 36 miles to Homer, La., and is going down at the rate of a mile a day. J. D. Beardsley, of Gibsland, is General Manager. (June 24, p. 467.)

MARSHALL, TIMPSON & SABINE PASS.—Tracklaying is to begin at once on the extension of this line from Russellville, Tex., north 12 miles to Carthage. Avery & Co., of Timpson, Tex., have the contract. T. S. Garrison, of Timpson, is General Manager. (June 10, p. 421.)

MISCELLANEOUS COMPANIES.—The Laporte, Wharf & Channel Co. was incorporated in New Jersey, with a capital stock of $1,000,000, to build docks and railroads, especially in Texas. The incorporators are: Alvey W. Momeyer, Charles E. Brownell and William B. McKean, of New York. The Laporte Improvement Co. is also incorporated with the same capital stock and incorporators as the other company.

MISSISSIPPI RIVER, HAMBURG & WESTERN.—A large shipment of rails is reported to have reached Hamburg, Ark., and track-laying is to be pushed rapidly between Montrose and that city. This line is to run from Hamburg, Ark., east 46 miles to Cone City on the Mississippi River and track is laid on a portion of the line. A. M. Gibson, of Portland, Ark., is Chief Engineer. (April 1, p. 245.)

MOSCOW, CAMDEN & SAN AUGUSTINE.—Work is to begin at once on this line from Moscow, Tex., a point on the Houston, East & West Texas, northeast about 50 miles through Tyler and Angelina counties to San Augustine. The Directors are given under Elections and Appointments.

NORFOLK & PORTSMOUTH BELT.—Track-laying is completed on this belt line from Berkeley to Port Norfolk, Va., 6.5 miles. Joseph U. Crawford, Broad Street Station, Philadelphia, is Chief Engineer. (Feb. 11, p. 112.)

NORTHERN PACIFIC.—Grading is completed on the line along the Columbia River from Vancouver, Wash., south about 35 miles to Kalama. The company has plans perfected for a bridge across the Columbia to Vancouver. Work will be begun at once, and it is expected the bridge will be finished by Oct. 1. When the bridge and road are in operation, the ferry across the river to Kalama will be discontinued, and the road between Goble and Portland, Ore., turned over to the Astoria & Columbia River road. (Dec. 17, 1897, p. 898.)

OCONEE & WESTERN.—Final surveys are made for the proposed extension from Hawkinsville, Ga., southwest about 30 miles to Cordele. (May 20, p. 367.)

OMAHA BRIDGE & TERMINAL.—A franchise has been received in the city of Council Bluffs, Ia., to extend the tracks of this company within that city, and work is in progress by the company's own forces. No new rolling stock will be required, and the extension will not reach beyond the city. (Official.)

PHILADELPHIA & READING.—Surveys are completed and about three-fourths of the work done on the second track of the Little Schuylkill, between Tamaqua, Pa., and East Mahanoy Junction. The building is being done by the company, except as to bridges. These are to be four in number, aggregating 300 ft., and bids for them were due July 2. The work is of medium character, the maximum grade being 1.4 p. c. and the maximum curve 8½ deg. (Oct. 29, 1897, p. 775.)

On account of the frequent falling of rock and dirt at Gwynedd (Pa.) tunnel, the company has decided to remove about 60 ft. at the north end. (Official.)

PONTOTOC & STARKVILLE.—The Governor of Mississippi has authorized the organization of this company to build a line from Pontotoc, Miss., south about 65 miles to Starkville, on the Illinois Central. This is practically an extension of the Gulf & Chicago, which runs from Middleton, Tenn., south 62 miles to Pontotoc.

RALEIGH & CAPE FEAR.—Rails are laid for five miles from Raleigh, N. C., south toward Lillington, 35 miles. John A. Mills, of Raleigh, is President (June 24, p. 467.)

REIDSVILLE & DORCHESTER.—This company has applied for a charter in Georgia with a capital stock of $100,000 to build a road from Reidsville southeast about 50 miles to Dorchester. The incorporators are: Henry C. Perkins, Augusta, Ga.; George W. Perkins, W. C. Perkins and T. W. Hardwick, Tennille, Ga.; Dr. William Rawlings, C. G. Rawlings and R. L. Warthen, Sandersville, Ga.; J. H. Perkins, Macon, Ga.; R. M. Martin, Hinesville, Ga., and H. L. Perkins, Wadley, Ga.

RICHMOND, PETERSBURG & CAROLINA.—Five miles of track is laid from Petersburg, Va., south toward Stoney Creek, 18 miles. About 30 miles of additional track is graded. Gen. James S. Negley, 41 Broadway, New York, is Vice-President and General Manager. (June 10, p. 421.)

SAGINAW, TUSCOLA & HURON.—This company is replacing 35-lb. rails with 60-lb. on its line in Huron County, near Bad Axe, Mich. The work is being done by the company. (Official.)

ST. LOUIS, PEORIA & NORTHERN.—Following the conference between the Superintendents and Master Mechanics of the St. L., P. & N., the Chicago, Rock Island & Pacific and the Rock Island & Peoria railroads, it is reported that an agreement has been made to extend the St. L., P. & N. at once from Peoria, Ill., north 186 miles via Davenport, Ia., to St. Paul and Minneapolis. The C., R. I. & P. bridge is to be used at Davenport. The extension of the St. L., P. & N. to Peoria was completed early this year. (Jan. 21, p. 51.)

ST. LOUIS, SILOAM & SOUTHERN.—The International Construction & Improvement Co., of Fort Smith, Ark., has been incorporated in Arkansas with a capital stock of $1,000,000, to build this line, which is projected to run from St. Louis, Mo., southwest about 350 miles to Fort Smith. The incorporators of the construction company are: Jesse French, John L. French, H. D. Mackay, John Dooley and J. S. Drake. Hector D. Mackay, of Pomona, Mo., who is President of the St. L., S. & S., announces that he has made all financial arrangements, and the road will be built at once, including a branch from Little Rock, Ark., to Pomona, Mo. (Nov. 5, 1897, p. 791.)

SAN FRANCISCO & SAN JOAQUIN VALLEY.—Work is progressing rapidly on the new line from Stockton, Cal., west to Point Richmond. The big tunnel through the spur of the Coast Range is under ground 171 ft. on the east end and 158 ft. on the west end, and the contractors have 75 men at work night and day on 12-hour shifts. Three dredgers are at work throwing up tule lands west of Stockton. Grading is nearly finished on the extension of the Visalia Branch from Visalia south to Corcoran Junction on the main line. (June 17, p. 445.)

SOUTHERN PACIFIC.—The extension of the tracks in Waxahachie, Tex., is under consideration, but building is not yet begun. (Official.)

The company has been approached by citizens of Hueneme, Cal., to extend its line from that place to Oxnard, but nothing definite has yet been done, and no decision reached as to building. (Official.)

Work is begun, according to report, on the extension of the Visalia Branch from Visalia, Cal., southeast 12 miles to Exeter on the Porterville line. (June 17, p. 445.)

The St. Martinsville Branch, in Louisiana, from St. Martinsville northwest about 24 miles to Arnaudville, was opened for business July 5. (July 1, p. 485.)

STILLMORE AIR LINE.—Track is laid from Stillmore, Ga., northwest 31 miles to Monte. (June 24, p. 467.)

TALLAHASSEE SOUTHEASTERN.—The Florida Construction Co., which bought the franchises of this road some time ago, is reported to have put 300 men at work cutting ties and 280 men grading. The line is projected to run from Tallahassee, Fla., southeast through Oldtown to Gainesville, about 150 miles. Seven miles to Lake Como was completed and about 40 miles additional graded in 1893. Track-laying was to be resumed July 1. R. L. Bennett of Tallahassee is Vice-President and General Manager. (Dec. 3, 1897, p. 860.)

TENNESSEE CENTRAL.—This company has filed a mortgage to secure $5,000,000 of 5 per cent. 50-year gold bonds to the Mississippi Valley Trust Co., of St. Louis as Trustee. The proceeds are to be used for the extension from near Kingston, Tenn., on the west bank of the Clinch River west via Knoxville and Nashville to Clarksville, about 250 miles. The line was completed as far as Standing Stone, 27 miles, last year. (Jan. 7, p. 17.)

UNION, CORNUCOPIA & EASTERN.—The citizens of Union, Ore., are co-operating with the company to build this line from Union, southeast about 60 miles to the Seven Devils mining country. Arrangements are being made, according to report, to begin grading within a very few days.

UNION, COVE & VALLEY.—This company was incorporated in Oregon, June 23, with a capital stock of $25,000, to build a road from Union, Ore., north 12 miles to Cove. The incorporators are: E. P. McDaniel, J. F. Phy and P. J. Taylor. Surveys are now in progress and the company expects to have the road in operation by Oct. 15.

WAYCROSS AIR LINE.—Grading is completed, according to report, on this line from Nicholls, Ga., west 12 miles to Douglas, and track-laying was to be begun this week. (May 27, p. 383.)

WISCONSIN, INLAND LAKES & CHICAGO.—A trust deed for $10,000,000, with William H. Holden as Trustee, was filed at Chicago, June 30, to secure an issue of a like amount of 30-year 5 p. c. bonds. The proceeds are to be used to build a line from Chicago northwest to Rhinelander, Wis., with branches to Madison and Milwaukee, in all about 500 miles. E. R. Bryant of Princeton, Ill., is among those interested. The company was incorporated in Wisconsin, April 27, 1897, with a capital stock of $5,000,000. (April 30, 1897, p. 317.)

Electric Railroad Construction.

AMHERSTBURG, ONT.—Local press reports state that a Detroit, Mich., company has made a proposition to build an electric railroad between Amherstburg, Windsor and Harrow.

ATLANTIC CITY, N. J.—At a meeting of City Council the Ordinance Committee was instructed to prepare an ordinance authorizing the New Jersey Electric Ry. Co. to build a trolley line from the city limits to a terminal to be built at Maryland and Atlantic avenues. The road will run from Camden to the seashore, and will be elevated from Absecom across the meadows to the local terminal. The right of way and an option on a station site have been obtained.

BENTON FALLS, ME.—An electric railroad is proposed to run from Benton Falls to Fairfield, about five miles. Among those reported to be interested are E. F. Webb of Waterville, John T. Richards, Charles D. Brown, Elisha Morgan and Edwin W. Heath of Benton Falls.

BOBCAYGEON, ONT.—The directors of the Bobcaygeon & Peterboro Electric RR. elected the following officers: W. C. Moore, President; S. H. Thorne, Vice-President; W. J. Reid, Secretary and Treasurer. This is a new company, organized to build between Bobcaygeon and Peterboro.

CAMBRIDGE, MD.—A part of the road in Dorchester County has been graded for nearly a mile, and the Commissioners have asked for the subscription of $75,000, which was to be made when this condition had been fulfilled.

CLEVELAND, O.—The Cleveland & Eastern Ry. Co. has organized by electing the following officers: H. P. McIntosh, President; H. A. Sherwin, Vice-President; E. G. Tillotson, Secretary and Treasurer. The Board of Directors are H. P. McIntosh, H. A. Sherwin, R. A. Harman, H. Clark Ford, W. H. Lamprecht, Howard White, W. G. Gates and E. G. Tillotson. (April 1, p. 246.)

COLORADO SPRINGS, COLO.—The Florence & Cripple Creek Electric RR. is given authority to run across the Pike's Peak reservation. The electric plant is at Goldfield, but it will be January before the plant (now being built) is in full operation; a few small lighting dynamos are now running. The Florence & Cripple Creek Southern is surveyed south of Florence as an extension of the Florence & Cripple Creek. The Golden Circle is an extension of the Florence & Cripple Creek through the mining camp to the north. The surveys have been extended through South Platte Canon to Denver. After the electric plant is up power will be applied to a portion of the line, probably the Golden Circle (now operated as a steam road) first, and the plant gradually extended. Among those interested in these roads are S. T. Smith, D. H. Moffat, J. E. Rockwell and Irving Howbert.

GRAFTON, MASS.—Press reports state that the Grafton Union Street Ry. Co. is given a franchise to build between Grafton and Upton.

HARRISBURG, PA.—Work will begin very soon on the Reservoir Park loop of the Harrisburg Park Co., the consent of all of the property owners having been granted.

HARTFORD, CONN.—It is expected that work will begin on the Hartford & Torrington Tramway Co.'s electric road about Aug. 1. Emerson, McMilan & Co. of New York, will probably finance the company. Senator Gay of Farmington, Livingstone Bogardus, Torrington, and Noble E. Pierce, Bristol, are interested.

KANSAS CITY, MO.—Press reports state that the Central Electric Ry. Co. was recently incorporated with a capital stock of $1,000,000, and will merge with the Northeast Ry. Co.

LONG ISLAND CITY, N. Y.—The New York & North Shore RR. Co. has made a mortgage with the New York Security & Trust Co., as trustee for $1,500,000, to secure the payment of 1,500 30-year gold bonds. The New York & North Shore is a corporation formed by the managers of the New York & Queens County, and the money arising from the sale of the bonds will be used in building a continuous line from the terminus of the Queens County line in Flushing to Whitestone, Bay Side, and Manhasset. Sixty miles of new track are projected on 30 miles of road. It is reported that when the new additions are built a combination will be formed by which a passenger will be able to travel from Long Island City to Jamaica and to Rockaway, on the south side, and to Flushing and Manhasset on the Sound, for a five-cent fare. (Apr. 29, p. 317.)

LOS ANGELES, CAL.—The San Gabriel Electric Co. has completed its road, and the preliminary tests have proved satisfactory. The power plant has been put up under the direction of Mr. R. S. Mason of the Westinghouse Company, and to guard against any accident duplicate machinery has been installed. stalled.

PARKERSBURG, W. VA.—The Seventh street section of the street railroad has been nearly completed, and work on the power house has also been nearly finished. Tracklaying is now being pushed.

ROYAL OAK, MICH.—A. F. Newberry and J. H. Holman of Rochester, Mich.; John Scott and Frederick Baker of Detroit, are reported to have received franchises to build an electric railroad between Royal Oak, Rochester and Romeo, about 20 miles.

ST. THOMAS, ONT.—The St. Thomas Electric Ry. has completed its road of six miles, and cars are running.

SAN MATEO, CAL.—Work will be begun on the 18th street line next week. It is proposed to lay a double track roadbed on 18th street, from Guerrero

to Danvers. The company is also rebuilding its 13th street branch, new and heavy rails being laid to replace those formerly in use.

STRATHROY, ONT.—The Strathroy & Western Counties Ry. will begin work on that part of its road from Strathroy to a point on the Canadian Pacific, and will probably build to Bosanquet. C. Gustin, Valley Grove, Ont., is one of the directors.

TAUNTON, MASS.—The Taunton & East Taunton Street Ry. Co. is given a charter to build an electric road four miles long. Among those interested in the company are: M. A. Cavanaugh, C. R. Richmond, J. P. Dunn and C. R. Barstow of Taunton, and S. F. O'Hara of Middleboro.

WASHINGTON, D. C.—The Eckington Ry. will probably be changed, within the city limits, to the conduit electric system. Outside the city limits the present overhead line will be improved and beyond the District of Columbia limits the overhead line will be extended for a distance of four or five miles along the original line of the Columbia & Maryland line, running close to the line of the Baltimore & Ohio Railroad.

WHITE PLAINS, N. Y.—The Tarrytown, White Plains & Mamaroneck RR., the first line to connect Long Island Sound with the Hudson River, is completed, and cars are running over the new branch from White Plains to Mamaroneck. The route is about 18 miles long, and includes a short branch to the Bloomingdale Asylum. (Jan. 14, p. 35.)

GENERAL RAILROAD NEWS.

Railroad Earnings.

Showing the gross and net earnings for the periods ending at the dates named:

May 31:		1898.	1897.	Inc. or Dec.
Denver & Rio Grande.				
1 month	Gross	$658,248	$558,050	I. $100,198
1 "	Net	259,281	234,071	I. 25,210
11 months	Gross	7,631,202	6,328,299	I. 1,302,903
11 "	Net	3,036,379	2,592,370	I. 444,009
Erie.				
1 month	Gross	$2,826,328	$2,716,875	I. $109,453
1 "	Net	721,084	710,335	I. 10,749
Lehigh Valley.				
1 month	Gross	$1,399,213	$1,398,197	I. $1,016
1 "	Net	263,442	211,903	I. 51,539
6 months	Gross	8,476,040	8,275,676	I. 200,364
6 "	Net	1,992,721	1,506,598	I. 486,123
Long Island.				
1 month	Gross	$401,717	$348,141	I. $53,576
1 "	Net	134,169	116,829	I. 17,340
11 months	Gross	3,888,991	3,528,114	I. 360,877
11 "	Net	1,143,125	1,037,281	I. 105,844
Mexican Central.*				
1 month	Gross	$1,165,656	$1,090,380	I. $75,276
1 "	Net	466,531	341,658	I. 124,873
5 months	Gross	5,635,036	5,486,948	I. 148,088
5 "	Net	1,778,977	1,875,791	D. 96,814
*Mexican currency.				
Mexican National.*				
1 month	Gross	$506,649	$506,211	I. $438
1 "	Net	229,161	250,781	D. 21,620
5 months	Gross	2,529,921	2,519,375	I. 10,546
5 "	Net	1,146,049	1,217,478	D. 71,429
*Mexican currency.				
New York, Ontario & Western.				
1 month	Gross	$275 719	299,006	D. $23,287
1 "	Net	49,002	64,552	D. 15,550
11 months	Gross	3,598,901	3,544,730	I. 54,171
11 "	Net	1,029,382	1,021,618	I. 7,764
Pennsylvania.				
1 month	Gross	.....	.....	I. $314,200
1 "	Net	.....	.....	I. 29,400
5 months	Gross	.....	.....	I. 1,710,800
5 "	Net	.....	.....	I. 150,700
Pennsylvania Company.				
1 month	Gross	.....	.....	I. $381,900
1 "	Net	.....	.....	D. 85,200
6 months	Gross	.....	.....	I. 2,167,100
6 "	Net	.....	.....	I. 407,000

June 30:		1898.	1897.	Inc. or Dec.
Texas & Pacific.				
1 month	Gross	$437,333	$417,855	I. $19,478
6 months	Gross	3,521,181	3,050,475	I. 470,706

BALTIMORE & OHIO.—The holders of first preferred stock at a meeting in Baltimore, June 28, declared it the sense of the meeting that none of the holders of that security can justly or lawfully be required to determine whether or not they will accept the proposition of the reorganization committee until the suit of the Johns Hopkins University shall be decided by the Supreme Court of the United States. They invited the reorganization committee to co-operate with them in hastening this decision. (July 1, p. 486.)

The receivers have announced interest payments on July 1, as follows: At the Mercantile Trust Co., New York, interest on receivers' car trust certificates, $102,400; at the office of the Baltimore Trust & Guaranty Co., Baltimore, Pittsburgh & Connellsville certificates, $16,250; at the office of the Treasurer of the B. & O., Pittsburgh & Connellsville first mortgage 7 p. c., $49,665; Winchester & Potomac first and second mortgages, $6,564; Winchester & Strasburg, $1,492; at the office of the Equitable Life Assurance Society, B. & O. bonds of the City of Baltimore, $6,000; at the office of the Mercantile Trust & Deposit Co., Baltimore, B. & O. car trust bonds of 1887, $6,250.

Hallgarten & Co., New York, give notice to holders of 5 p. c. second mortgage bonds of the Staten Island Rapid Transit Co., which are guaranteed by the B. & O. under the mortgage dated Nov. 21, 1895, that they will accept deposits of the same and act for the bondholders in reorganization. In exchange for bonds deposited with them, they will issue certificates countersigned by the Central Trust Co., New York.

CENTRAL PACIFIC.—The United States Senate on June 29 adopted an amendment to the General Deficiency Appropriation bill providing for a settlement of the indebtedness to the Government of the Central Pacific and Western Pacific roads as follows:

That the Secretary of the Treasury, the Secretary of the Interior and the Attorney-General and their successors in office be and they are hereby appointed a commission with full power to settle the indebtedness to the Government growing out of the issue of bonds in aid of the construction of the Central Pacific and Western Pacific bond-aided railroads, upon such terms and in such manner as may be agreed upon by them, or by a majority of them, and the owners of said railroads; provided, that any and all settlements thus made shall be submitted in writing to the President for his approval or disapproval, and unless approved by him shall not be binding.

That said commission shall not agree to accept a less sum in settlement of the amount due the United States than the full amount of the principal, and all amounts necessary to reimburse the United States for moneys paid for interest or otherwise. And also provided, that said commission are hereby empowered to grant such time or times of payment, by installment, and at such rates of interest, to be not less than 3 per cent. per annum, payable semi-annually, and with such security as such commission may deem expedient; provided, however, that in any settlement that may be made the final payment and full discharge of said indebtedness shall not be postponed to exceed ten years, and the whole amount, principal and interest, shall be paid in equal semi-annual installments within the period so limited, and in any settlement made it shall be provided that if default shall be made in any payment of either principal or interest, or any part thereof, then the whole sum and all installments, principal and interest, shall immediately become due and payable, notwithstanding any other stipulation of said settlement.

That there is hereby appropriated, out of any money in the Treasury not otherwise appropriated, the sum of $20,000 to defray the expenses of said commission in making the said settlement. (June 10, p. 422.)

The House concurred in the bill July 6.

CINCINNATI & MUSKINGUM VALLEY.—This road was sold at auction June 29 at Zanesville, O., by order of the United States Court, to John P. Green, of Philadelphia, of the Pennsylvania Railroad, for $500,000. Notice of the new incorporation appeared in this column last week, page 486.

GALVESTON, LAPORTE & HOUSTON.—Judge Bryant at Sherman, Tex., June 21, ordered the receivers to file within six days a report showing the number, date and amounts of receivers' certificates outstanding, with the name of the party to whom issued and the purpose; also the name of each party having claim of any character against the road; also a statement of litigation pending against the receivership, including the name of the plaintiff, the cause of action and the amount claimed. (June 10, p. 422.)

KINDERHOOK & HUDSON.—Judge Chester of Albany, N. Y., has granted the petition of Rufus M. Townsend and others to set aside the election of officers of this road, held last April. The ground of the petition was that the election was secured by the improper use of a temporary injunction to prevent three of the original directors from voting 60 p. c. of the stock, which they controlled. (May 27, p. 384.)

MAINE CENTRAL.—The $756,800 7 p. c. bonds which fell due July 1, together with their coupons, will be paid on presentation by Vermilye & Co., Boston. This company bought $626,500 consolidated 4 p. c. bonds, due in April, 1912, issued to refund this maturing loan, and offers to exchange the same for the old bonds at 105 and interest. (March 11, p. 190.)

MAYSVILLE & BIG SANDY.—An order was entered in the Circuit Court at Maysville, Ky., July 2, by Judge Harbeson appointing J. E. Kehoe Receiver of this line, now the Cincinnati Division of the Chesapeake & Ohio. The road runs from Ashland, Ky., to Covington, 142.5 miles. The C. & O. owns $5,000,000 of the $7,500,000 stock and all the bonds. The order is due to refusal of the road to pay judgments against the line obtained by citzens of Maysville and Dover several years ago because of damages caused by the building of the road. A motion was made a year ago for the appointment of a receiver, but was overruled because the C. & O. claimed that it held a mortgage prior to the judgments, but this ruling has been reversed by the Court of Appeals.

MEXICAN INTERNATIONAL.—This company has filed a certificate with the Massachusetts Secretary of State for an increase of stock from $17,000,000 to $25,000,000.

NEW ENGLAND.—The Railroad Commissioners of Massachusetts approved on June 30 the lease of the New England to the New York, New Haven & Hartford, and the formal transfer was made July 1. (June 17, p. 445.)

OHIO SOUTHERN.—A second decree of foreclosure sale was entered against this road at Lima, O., June 30, with J. T. Adams and Byron Roloson as Special Masters. The second mortgage bondholders have filed their bill of exceptions preparatory to taking it to the Circuit Court. (May 13, p. 350.)

PHILADELPHIA, READING & NEW ENGLAND.—The sale of this line is to take place at Poughkeepsie, N. Y., Oct. 6, at 2 p. m. The upset price is $2,140,000, and each bidder must deposit $100,000 in cash or certified check, and the successful bidder must pay the balance of the bid within 40 days from date of sale. The sale also includes the property of the Poughkeepsie Bridge Co. and 13,900 shares of capital stock of the Hartford & Connecticut Western of the par value of $100, pledged by the P., R. & N. E., with the plaintiff as collateral security for the payment of the principal and interest of the bonds under which the sale is made. (May 13, p. 350.)

SOUTHERN.—On June 21, formal transfer was made to the Southern of the property and franchises of the Virginia Midland, of which substantially all the capital stock is owned by the S. Ry. The V. M. runs from Alexandria, Va., to Orange, 77.54 miles, and from Charlottesville, Va., to Junction, 125.18 miles, besides several other branches. The S. Ry. has also acquired the property and franchises of the Knoxville, Cumberland Gap & Louisville, which extends from Knoxville, Tenn., to Cumberland Gap, about 63 miles, with trackage rights over about five miles of the Louisville & Nashville, from Cumberland Gap to Middleboro, Ky. The stockholders of the K., C. G. & L., accepted the proposition June 27.

SOUTHERN INDIANA.—This company has made an issue of $1,500,000 first mortgage 5 p. c. gold bonds from June 1, 1898, of which $1,000,000 is outstanding. It is successor to the Evansville & Terre Haute and owns from Elnora, Ind., east 101.4 miles to Westport. (Jan. 14, p. 36.)

TERRE HAUTE & INDIANAPOLIS.—The coupons due July 1 on both the consolidated and new coupon mortgages are being paid by the Farmers' Loan & Trust Co., New York. (Feb. 11, p. 112.)

UNION PACIFIC, CENTRAL BRANCH.—The Central Branch of the U. P. has been reincorporated in Kansas with a capital stock of $2,500,000, and with power to issue bonds up to $2,500,000. The Directors are: James M. Hamm and Edward H. Ladd of New York; W. H. Rossington, Hiram P. Dillon, Archie Williams and Charles Blood Smith. This line was formerly known as the Atchison & Pike's Peak and runs from Atchison, Kan., west 100 miles to Waterville. It was sold to the Borg Committee May 23. The two leased lines, the Atchison, Colorado & Pacific, and the Atchison, Jewell County & Western, have also been reincorporated and are to form part of the new system, which, it is understood, is to be controlled by the Missouri Pacific. (June 17, p. 446.)

UNION PACIFIC, LINCOLN & COLORADO.—Judge Foster, at Topeka, Kan., June 23, issued a decree of foreclosure of this road, which runs from Salina, Kan., to Oakley, 225.4 miles. Of the $2,309,800 capital stock, $1,997,800 is owned by the Union Pacific. The road went into the hands of receivers with the parent company on Oct. 13, 1893. (March 11, p. 190.)

WACO & NORTHWESTERN.—Wilbur F. Boyle of St. Louis, Mo., has complied with the orders of the United States Circuit Court of New Orleans and completed the payment of $1,500,000 for this property. Judge Boyle bought the road at foreclosure sale Sept. 3, 1895, it having been placed in the hands of a receiver Dec. 11, 1892. The line runs from Bremond, Tex., to Ross, 54.68 miles. The transfer was made June 30. (June 10, p. 422.)

Electric Railroad News.

BALTIMORE, MD.—An order has been signed whereby the claims against the Columbia & Maryland Railway Co. can be settled. Upon the settlement of all claims the trustee is authorized to assign to the Maryland Traction Co. all the property and franchises bought by the Baltimore Security & Trading Co. The order includes also the stock and bonds of the Eckington & Soldiers' Home Railway Co., and of the Catonsville Short Line. The conveyances and deliveries will probably be made next week.

BOWLING GREEN, KY.—A reorganization of the Bowling Green St. Ry. Co. has been effected, and the property is now in the hands of the Fidelity Trust Co., of that city. Several months ago the company went into the hands of a receiver, and by order of court the property was sold at public auction. The Trust Co., which had a lien of $23,000 on the property, bid it in. A new company was then organized, with Mr. T. H. Whayne, of the Fidelity Trust Co., as President. Secretary Mahon, of the Trust Co., is reported to have said that his company did not expect to hold the property, but would dispose of it as soon as possible.

BROOKLYN, N. Y.—The gross earnings of the lines of the Brooklyn Rapid Transit Co. for periods ending May 31 were as follows:

June Passenger Earnings.	1898.	1898.	Inc. or Dec.
B. H. R. R. and B., Q. C. & S.	$477,946	$563,483	I. $85,537
Other earnings from operation	17,060	16,556	D. 504
Gross earnings	$495,006	$580,039	I. $85,033
12 Months' Passenger Earnings—			
B. H. R. R. and B., Q. C. & S.	$5,105,118	$5,461,942	I. $356,824
Other earnings from operation	213,216	209 377	D. 3,839
Gross earnings	$5,318,334	$5,671,319	I. $352,985

BUFFALO, N. Y.—The foreclosure sale of the Buffalo, Kenmore & Tonawanda is advertised for Aug. 22, at 210 Pearl street, Buffalo. (Jan. 24, p. 468.)

HARRISBURG, PA.—The Cumberland Valley Railroad Co. has secured a controlling interest in the Harrisburg and Mechanicsburg Electric Railway Co. On Saturday evening last the latter road was reorganized, and the following were among the directors elected: President, S. C. Gilbert, Harrisburg; B. F. Myers and W. L. Gorgas, of Harrisburg; J. J. Baughman, New Cumberland. The new parties have secured more than 50 per cent. of the stock of the reorganized company.

MONTREAL, QUE.—The Quebec District Railway Co. has been turned over to the control of the Quebec, Chalevoix & Montmorency Railway Co. It is proposed to increase the present traffic facilities of the latter road and to make some extensions.

NEW ORLEANS, LA.—The New Orleans Traction Co. reports earnings for periods ending May 31 as follows:

	1898.	1897.
One month—		
Gross earnings	$125,699	$121,407
Operating expenses	70,441	78,781
Net earnings	$55,258	$42,626
Five months—		
Gross earnings	$568,166	$543,085
Operating expenses	311,509	351,912
Net earnings	$256,657	$191,173

SANDUSKY, O.—The foreclosure sale of the Sandusky street Ry. is advertised to take place July 9. Rollin B. Hubbard and J. O. Moss, Trustees.

TRAFFIC.

Traffic Notes.

On June 29 corn was taken by vessel from Chicago for Buffalo at ⅝ of a cent a bushel, the cheapest rate known for years. The grain movement is very light at present and not many shipments were made at this rate.

Special Agent I. N. Mills of the Delaware Railway, has completed his canvass of the peach raising territory along the line of his road and finds that the crop will be a failure. That is to say, he estimates only about 300,000 baskets, which is only one-third of last year's crop, 1-10 of the crop of 1896, and 1-30 of the normal crop. The fruit has been destroyed this year by the curculio.

The State Railroad Commissioners of Florida have ordered a reduction in passenger fares on nearly all the railroads of the state. On the eight principal roads it is ordered that the rate after July 18 be not over 3 cents a mile; hitherto 4 cents has been the prevailing rate, except on some branches, where the rate has been 5. On eight smaller roads the order prescribes a rate of 4 cents a mile.